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# AN EVALUATION OF PAIN MANAGEMENT POST SURGERY

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December 2000

Supervisor: Professor T. O'Dowd

A thesis submitted for the degree of
Doctor of Philosophy at the
University of Dublin, Trinity College

Department of Community Health and General Practice

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# DECLARATION

This dissertation is presented in fulfilment of the requirements of the Ph.d. degree of the University of Dublin. It has not hitherto been submitted to any other university. I wish to confirm that this work is entirely my own except where otherwise acknowledged.

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Kathleen Mac Lellan

**Kathleen Mac Lellan**

Date: 06/12/00

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# SUMMARY

Patients continue to suffer moderate pain post surgery, much of which may be unnecessary with careful strategic pain management. The influence of routine and rituals in the management of pain is evident from the literature. The advent of acute pain teams and new understanding and methodologies of pain management are positively affecting patient outcomes. However it appears that knowledge and attitudes of both health care professionals and patients continue to be a strong influence on the patient's pain experience.

The study design for this research was experimental in nature. A parallel clinical trial, this study compared patients' pain experiences within two hospitals, a control and an intervention hospital, over time. Patients' pain scores and their knowledge and attitudes were measured in both hospitals at two time periods. Baseline data was compared to subsequent data collected after the introduction of a nurse-led intervention in the intervention hospital. The control hospital was incorporated into the design to evaluate temporal effects, which might produce changes in patients' pain experiences. A total of eight hundred patients were surveyed using a structured questionnaire to capture patients' experiences and pain was measured five times a day on a visual analogue scale for 48 hours post surgery.

The intervention introduced by the author included short pain courses for nurses, pain assessment, a pain conference, a poster display and the development and introduction of a pain policy. The results of the research from this thesis show that improvements in pain management for patients can be made through better utilisation of nursing staff and nursing skills. These results demonstrate that the introduction of a nurse-led intervention positively

affected patients' pain experiences following surgery in a number of ways. Significant changes were seen in the intervention hospital, which were not evident in the control hospital.

The research demonstrated that the introduction of a nurse-led intervention reduced patients' pain scores. This reduction, in the order of .9 (9%) on a visual analogue scale (0-10) was statistically significant for the first five twelve-hour time periods post surgery ($p<.001$). This reduction was not seen in the control hospital. This is an overall reduction of 9% in patients' mean pain scores and as such has clinical relevance. The intervention significantly improved patients' description of both the intensity and the nature of patients' pain ($p<.05$) in the intervention hospital. These significant improvements were not seen in the control hospital. The intervention significantly improved patients' timing of requests for analgesia ($p<.05$) in the intervention hospital. This improvement was not evident in the control hospital. The intervention significantly improved adequacy of information given to patients ($p<.001$) as perceived by patients in the intervention hospital. This was not seen in the control hospital.

The research methodology in this thesis is unique by virtue of its experimental approach using both a control hospital and an intervention hospital to evaluate changes in patients' perceptions of pain following the introduction of a nurse-led intervention. The study provides new knowledge relating to pain management post surgery demonstrating that the introduction of a nurse-led intervention significantly reduced patients' pain scores in the order of 9% thus positively affecting their pain experience. The study proposes a new model for reducing the theory-practice gap in acute pain management.

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## ABBREVIATIONS

| | |
|---|---|
| APS | Acute Pain Service |
| I.M. | Intra-muscular |
| IV | Intra-venous |
| NSAIDs | Non Steroidal Anti-Inflammitories |
| PCA | Patient Controlled Analgesia |
| P.R.N. | Pro re nata (as needed) |
| VAS | Visual Analogue Scale |
| WHO | World Heath Organisation |

# Chapter 1

## Introduction

***"By any reasonable code, freedom from pain should be a basic human right, limited only by our knowledge to achieve it"***[1]

This editorial of the International Pain Foundation, now twelve years old, challenges nurses and health care professionals to give consideration to their role in pain management. Lisson [2] maintains that few things that a nurse does are more important than alleviating pain. Pain assessment and pain management are important aspects of patient care in which nurses play a key role.[3]

Two key principles that underpin the *Irish Health Strategy, Shaping a Healthier Future* [4] are quality of service and accountability. Health and social gain as outlined in the strategy indicates that patients/ clients of the health services should receive a clear benefit or outcome from their contact with the service. This emphasis on outcomes has clear implications for nursing services. Health care workers providing a service must consider the quality of that service and look towards outcome measurements. The World Health Organisation (WHO) in 1998 emphasises that the objective of a comprehensive health care delivery system is to provide services to deal with existing health problems through the best utilisation of available resources.[5] McQuay[6] states that effective pain management is fundamental to quality of care.

The author of this thesis hypothesised, that the deficiencies in nurse education, and the lack of knowledge and lack of use of worldwide developments in acute pain management lead to poor pain management post surgery. This could be improved, thus providing a better patient

service. At the time of the study there were no inherent audit structures in place to evaluate the current situation in relation to pain management in the hospitals studied in this thesis.

Postoperative pain management is an important aspect of the care offered to surgical patients. It is the most common form of acute pain seen in hospital settings. There have been many advances in the understanding of acute pain physiology and in the development of appropriate analgesics. These advances have improved the care of post-operative patients however studies show that postoperative pain continues to be inadequately treated and that patients continue to suffer moderate to severe pain.[7 8 9 10 11 12 13 14] Research findings indicate that nurses and physicians are primarily responsible for the existence of patients' unnecessary pain, which is an all too common side effect of hospitalisation and illness.[15]

The nurse's responsibility in relation to pain management is multifaceted. Every nurse is accountable for his/ her professional actions[16] and must therefore take responsibility for the care given to his/ her patients. The development of the most effective pain management plan requires that careful attention be paid to the type of analgesic used, the route of administration chosen and the timing of analgesic administration.[17]

This study evaluates the effects of the introduction of a number of measures to improve post-operative pain management by nurses in a training hospital in Dublin, Ireland. The literature review explores the relationships between nurse knowledge, nurse education and nurse attitudes in decision making in pain management. The lack of a national statement or strategy pertaining to acute pain management has led to a stagnation of practices and procedures in

this country. The profound lack of Irish nursing research in the management of pain only adds to this existing state.

Our colleagues in the Royal College of Surgeons and Anaesthetists in England [18] published their report in 1990. This report led to a number of changes in acute pain management in England, changes which as of yet have not been developed in Ireland. The aim of the Royal College of Surgeons and Anaesthetists report was to improve the treatment of postoperative pain in all hospitals by implementation of the following recommendations:

- Improve hospital staff education and challenge traditional attitudes to postoperative pain relief;
- Assess and record pain systematically, involving the patient whenever possible;
- Responsibility for the management of pain relief policy after surgery in each hospital is given to a named member of staff;
- Establish acute pain teams in all major hospitals;
- Introduce new methods and utilise existing methods more effectively giving due regard to safety;
- Audit and continuous appraisal of activity;
- Establish appropriate facilities for the provision of adequate postoperative pain relief in all hospitals;
- Provide properly trained staff and resources for these services;
- To continue and identify research into:
    - Development of better and safer drugs to relieve pain
    - Monitoring of patients after surgery
    - Safety and efficacy of new methods of pain relief
    - Counselling and psychological methods of pain relief.

## 1.1 STUDY DESIGN

The study design is a parallel clinical trial[19] as described by Abramson in 1990. The author compared (a) pain scores for a period of 48 hours after surgery and (b) results of a patient knowledge/ attitude questionnaire in two hospitals, the intervention and the control hospital pre and post an intervention in one of the hospitals (figure 1). The author introduced a number of structured interventions to improve pain management in the intervention hospital over a ten-month period and investigated how these changes affected patients' perceptions of their pain as compared to the control hospital which received no intervention.

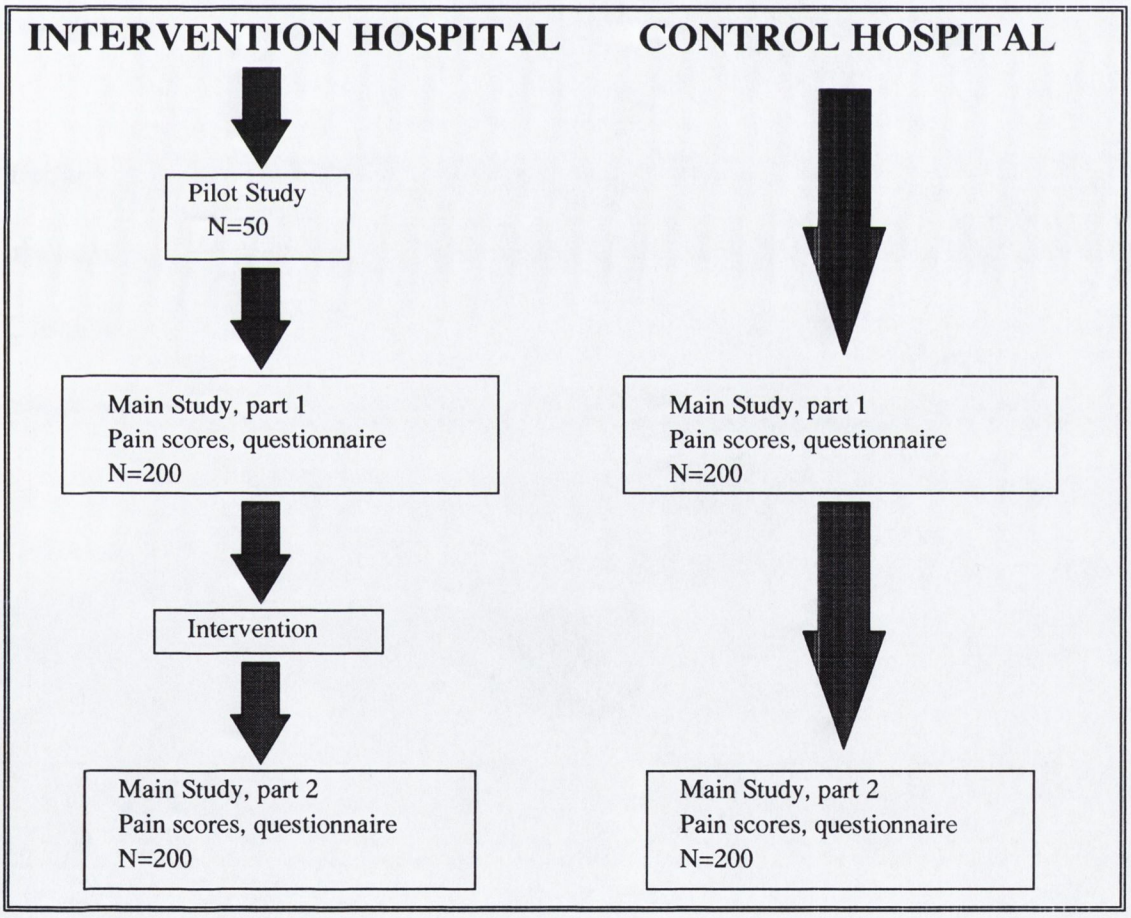


FIGURE 1 STUDY DESIGN

The two hospitals, were deemed to be comparable because of the following:

1. Similar patient profile;

2. Similar history;

3. Similar nurse training systems.

### *1.1.1 Hospital Activities*

The two hospitals were located in Dublin County Borough and had geographic proximity. The hospitals were located in District Electoral Divisions 157 and 162. Small area population statistics for the 1996 Census showed that both hospitals provided for a community with comparable socio-economic groups, age groups and unemployment levels.[20]

Table 1 indicates the annual in-patients' discharge activity for the types of operations included in the study for both hospitals for 1996. The Irish Department of Health and Children provided this data.[21] For the purposes of this study operations were divided into major and intermediate operations by a consultant anaesthetist.

TABLE 1 IN-PATIENTS DISCHARGED FOR PATIENT GROUPS 1996, INTERVENTION HOSPITAL AND CONTROL HOSPITAL

| WARD AREAS | INTERVENTION HOSPITAL | CONTROL HOSPITAL |
|---|---|---|
| **Orthopaedic** | 1484 | 1725 |
| **Urology** | 575 | 2534 |
| **Gynaecology Surgery** | 928 | 69 |
| **General Surgery** | 2426 | 1447 |

### *1.1.2 History of the control and the intervention hospital*

The following section describes the history of the control and the intervention hospital. In order to protect the confidentiality of the hospitals they will be referred to as Hospital A and Hospital B for this section.

**HOSPITAL A**[22]

Hospital A dates back to 1702. It was originally a foundling hospital for abandoned children and babies. The hospital was known for its system of "*revolving cradles*" where unwanted babies were placed and then taken away by attendants to be cared for and educated by the hospital. The "South Dublin Union", as it became known, was founded for the poor and destitute, with the aim of providing them with support and assistance. The health services were non-existent at this time.

In the 1940s the hospital changed its name to St. Kevin's. It was under the control of the Dublin Board of Assistance. There were 2,500 beds, in very crowded circumstances. Upgrading of many of the hospital buildings took place in the 1950s. The quality of the medical services improved significantly with the employment of consultants and the introduction of modern dispensing services. St. Kevin's played a major role in looking after the poor, sick and elderly. It was very much a hospital for the Dublin working-class people.

St. James's Hospital (Board) was established under the Health (Corporate Bodies) Act 1961 and the St. James's Hospital Board (Establishment Orders) 1971 and 1984, to manage and develop the hospital that previously known as St. Kevins. The public perception of St. Kevin's was still one of the workhouse where people went to die. The change of name from St. Kevin's to St. James's was therefore partially a public relations exercise to get away from

this perception. The ethos and thinking behind the Act came from the Fitzgerald Report (1960) which recommended the creation of a network of general hospitals to underpin the provision of health services. St. James's was one of the recommended sites. During the 1980s, when public spending came under severe scrutiny, cutbacks and rationalisation within the health service became the norm. Central to this policy of hospital rationalisation, Mercers, Patrick Duns, Baggot Street and Dr. Steeven's Hospital closed for acute services in 1986/ 1987. St. James's Hospital today, is a merger of a number of significant hospitals over the last ten years.

***Organisational structure***

The organisation and management structure of St. James's was at the time of the study in a state of transition from a traditional model based on centralised and hierarchical/ functional structures to a more decentralised, flatter, product service structure based on the organisation of the hospital into clinical directorates. This began in 1995 and a directorate management team now consists of a Clinical Director, Nurse Manager and a Business Manager. The Clinical Director is a member of the Executive Management Group. The nursing management structure for the wards included in the study remained at the time of the study hierarchical in nature and this is illustrated in figure 2.

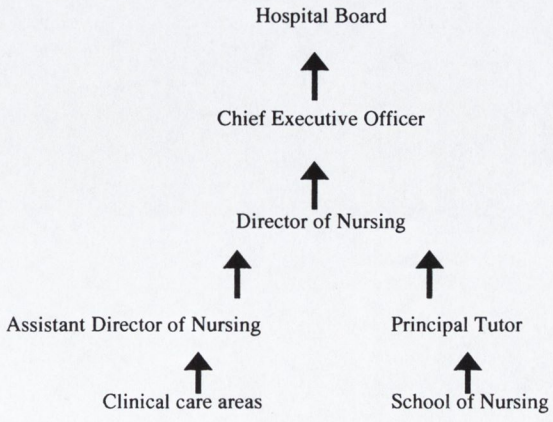


FIGURE 2 MANAGEMENT STRUCTURE OF HOSPITAL A

The Director of Nursing is a member of the Executive Management Group, which meets fortnightly and makes executive decisions on the day-to-day running of the hospital. The Director of Nursing has responsibility for patient clinical areas and reports directly to the Chief Executive Officer. The hospital at the time of the study had 720 beds with many specialities including urology, gynaecology, orthopaedics, and general surgery.

### *School of Nursing*

Anne Young established the School of Nursing in 1967. The nurse education curriculum provides for the education of the pre-registration students which includes both diploma and certificate students. Between 24 and 80 students completed a three-year training programme each year at the time of the study.

## HOSPITAL B[23]

Like St. James's Hospital, Hospital B was founded in the 1700s. The Meath Hospital first opened in 1753 in the Upper Coombe in rented accommodation. There was great poverty in this area among the public and the Meath Hospital was founded there to provide succour to the impoverished local population. Then, in 1756 it moved to Skinner's Alley. After four years it moved to Meath Street and from there it relocated to Earl Street in 1764. Eventually a site was obtained in the Coombe and Lord Brabazon laid the foundation stone of the new hospital on October 10th 1770. In 1774, the official title of the hospital was designated "The Meath Hospital and County Dublin Infirmary". In 1822 it transferred to its present premises in Long Lane with the building ultimately intended for 100 patients. The hospital was founded by lay people with the objective of relieving the distressed poor of Dublin's liberties. Like St. James's Hospital the Meath Hospital was affected by the changing health service in

the 1980s. Dr. Steeven's Hospital closed and some of its orthopaedic services and nursing staff were transferred to the Meath.

The hospital was at the time of the study an acute, voluntary, general hospital with 252 beds, including 24-day beds. Specialities included urology, gynaecology, orthopaedics and general surgery. In 1998 the Meath hospital ended its long life and amalgamated with the Adelaide and the National Children's Hospital in a new premises in Tallaght.

The hospital nursing management structure at the time of the study was traditional in its hierarchical nature with the line of management from ward sister to Assistant Director of Nursing to Director of Nursing and to the Chief Executive. This structure was similar to hospital A.

***School of Nursing***

In 1884 nurse probationers were employed and by 1889, fifteen were recruited every year for one year's training. In 1919 training was increased to three years with a qualifying examination.

### *1.1.3 History of Nursing in Ireland*

The Irish health services have evolved from a system governed by the Poor Law Act 1838 which provided relief for the poor and thus became responsible for the development of a number of the health services.[24] In the early days there were few paid nurses. Although the title *nurse* was used these nurses did not function in the same way as today's nurse. Nurse training began early in the 19th century, however this training was provided by and for

religious orders only at the time. Late in the 1880s formal-training programmes began to emerge. The 1919 Nurse Registration Act provided for the General Nursing Council of Ireland and for registration of nurses.[25] In 1949 a Nursing Officer was appointed to the Department of Health and it was not until 1998 that a Nursing Policy Unit headed by a Chief Nursing Officer was in place in the Department of Health and Children.

### *1.1.4 Nurse Training in Ireland*

The student nurse-training programme is set out in the Nurse's Act 1985[26] and is overseen by An Bord Altranais. The training programme at the time of this study was a three-year programme leading to a certificate qualification. The training requirements were identical for both hospitals.[27] The traditional model of pre-registration training and education has been described as an "apprenticeship" model. This system was based on classroom instruction and practical training, predominantly in a hospital setting. Student nurses worked in clinical areas and attended lectures.

The teaching of pain management was not directly included in the syllabus of the time.[28] There were three topics mentioned in the syllabus which relate to pain management:-

1. Under **Nursing principles in relation to General and Specialist Medicine, General and Specialist Surgery** - *The Nervous System.* Items mentioned here which relate to pain management are:- formation, structure and function of the brain, spinal cord, peripheral nerves and autonomic nervous system.
2. Under **Nursing principles in relation to General and Specialist Medicine, General and Specialist Surgery** - *The Cardio-Vascular and Reticulo-Endothelial System.* Item mentioned here which relates to pain management is:- Use and effects of analgesics
3. Under **Nursing principles in relation to General and Specialist Medicine, General**

**and Specialist Surgery** - *Operating Theatre Technique.*

Items mentioned here which relate to pain management are:- use and effects of anaesthetic drugs, local and general and analgesics.

All of the items above (1-3) covered aspects of pain management but pain was not approached as a module or a holistic subject. At the time of conducting the study there were no postgraduate courses available in the Republic of Ireland in acute pain management thus limiting the exposure of qualified nurses to further education in acute pain management.

This thesis is set out in nine chapters:

Chapter 1 Introduction and background to study

Chapter 2 Pain definitions and physiology

Chapter 3 Pain assessment

Chapter 4 Patients' and Nurses' knowledge and attitudes towards pain and its management

Chapter 5 Surgical pain management

Chapter 6 The relationship of acute surgical pain management to nursing theory, nursing models and nurses' clinical decision making.

Chapter 7 Methodology

Chapter 8 Analysis and Results

Chapter 9 Discussion and conclusions

In order to protect the confidentiality of the hospitals, the hospitals will be referred to as the intervention hospital and the control hospital for the remainder of this thesis.

# Chapter 2

## Pain Definitions and Pain Physiology

This chapter provides a brief overview of the definitions and current thinking of the physiology of pain. The difficulties that health professionals have in defining pain are evident in the abundance of literature available on the subject. Much is known about the physiology of pain however the sensory and emotive aspects of pain are difficult to separate. The belief that the mind and body interact indivisibly in the production and perception of pain is now broadly endorsed by experts in the field of pain therapy.[29] The last section of this chapter discusses surgical pain and its implications for patients.

### 2.1 THE DEFINITION OF PAIN

In 1985 Melzack and Wall described pain as an experience so common that rarely does anyone pause to define it in ordinary conversation. They said that no one person who has worked on the problem of pain has given it a definition, which is satisfactory to all of his colleagues.[30] Pain refers to a category of complex experiences, not to a specific sensation that varies only along a single-intensity dimension. Pain can be described as a private and internal sensation that cannot be directly observed or measured. Melzack stated that there is an endless variety of qualities to pain. Influences on how a person experiences pain include past experience, family attitudes, culture, meaning of the situation, attention, anxiety, suggestion and other factors unique to the individual.[31] McCaffrey in 1972 said, "pain is whatever the experiencing patient says it is, existing whenever he says it does".[32]

The International Association for the Study of Pain describes pain in the following terms:

*" Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Pain is always subjective. Each individual learns the application of the word through experiences related to injury in early life. Accordingly, pain is the experience that we associate with actual or potential tissue damage. It is unquestionably a sensation in a part of the body, but it is also unpleasant, and therefore an emotional experience. Many people report pain in the absence of tissue damage or any likely pathological cause; usually this happens for psychological reasons. There is no way to distinguish their experience from that due to tissue damage, if we take this subjective report. If they regard their experience as pain caused by tissue damage, it should be accepted as pain. This definition avoids tying pain to the stimulus. Activity induced in the nociceptor and nociceptive pathways by a noxious stimulus is not pain, which is always a psychologic state, even though pain most often has a proximate cause. "* [33]

Current definitions of pain rely on the person being able to describe his/ her own pain. Such definitions challenge our understanding of pain because they do not apply to living organisms that are incapable of self-report.[34] Many people are unable to describe their own pain for example, ventilated or confused patients or newborn infants.

## 2.2 PAIN PHYSIOLOGY

The perception of pain is a function of the nervous system. Peripheral pain receptors are called nociceptors. These are free nerve endings found in almost every tissue of the body. They may respond to any type of stimulus if it is strong enough to cause tissue damage. When stimuli for other sensations such as touch, heat and cold reach a certain threshold they stimulate the sensation of pain as well. Excessive stimulation of a sense organ causes pain.

Additional stimuli for pain receptors include excessive distension or dilation of a structure, prolonged muscular contractions, muscle spasms, inadequate blood flow to an organ or the presence of certain chemical substances. Pain receptors because of their sensitivity to all stimuli perform a protective function by identifying changes that may endanger the body. There are two main types of nerve fibres involved in the transmission of pain:- A delta fibres and C fibres. A delta fibres are small-diameter fibres which are myelinated and conduct the transmission of pain rapidly. C fibres are also small-diameter fibres, which are not myelinated and conduct the transmission of pain slower. Once pain receptors are stimulated the impulse they discharge travels to the spinal cord and on to the brain via the pain pathways. Nociceptors are specific for painful stimuli, responding to damaging or potentially damaging mechanical, chemical and thermal stimuli. Although the adequate stimulus for nociceptors is not known, it is assumed that a chemical such as histamine or bradykinin is released from cells damaged by the pain stimulus and that the chemical substance activates the nociceptors. Nociceptors can be sensitised so that they may continue to send pain messages long after the stimulus is removed.

Two types of pain sensation result from the application of a strong, noxious stimulus to the skin. (1) Fast pain is a well-localised, pinprick sensation that results from activating the nociceptors on the A delta fibres. (2) Slow or delayed pain is a poorly localised, dull, burning sensation that results from activating the nociceptors on the C fibres.[35]

### *2.2.1 Pain pathways*

Both fast and slow pain are carried via the spinothalamic tracts. However the messages terminate in different areas of the brain. The fast pain signals are relayed via the brain stem and thalamus to areas of the cortex especially the somatosensory area. This part of the cortex can differentiate the area from which the original message was sent with some accuracy. So people can pinpoint with reasonable accuracy to the area where an acute painful stimulus has been applied.

By contrast, slow pain signals terminate over a wide area of the brain stem and thalamus. The area within the brain stem, known as the reticular activating system, is involved. It is a region, which plays a significant part in the excitability of the brain itself. These slow pain signals are not relayed to the somatosensory cortex and are difficult to localise.[36]

Fast pain occurs very rapidly, usually within 0.1 second after the stimulus is applied, and is not felt in the deeper tissues of the body. This type of pain is also known as sharp, fast and pricking pain. The pain felt from a needle puncture or a knife cut into the skin are examples of fast pain. Slow pain begins after a second or more and then gradually increases in intensity after a period of several seconds or more. It is referred to as burning, aching, throbbing and slow pain. An example is the pain associated with toothache.[37]

The two types of pain sensation elicit different reflexes. Fast pain evokes a withdrawal reflex and a sympathetic response including an increase in blood pressure and a mobilisation of body energy supplies. Slow pain produces nausea, profuse sweating, a lowering of blood pressure and generalised reduction in skeletal muscle tone.[38]

### *2.2.2 Gate Control Theory*

This theory suggests that pain impulses must pass through the substantia gelantosia cells, which are present in the dorsal horn of grey matter to travel to the brain. The theory proposes that a neural mechanism in the dorsal horns of the spinal cord acts like a gate which can increase or decrease the flow of nerve impulses from the peripheral fibres to the central nervous system. The degree to which the gate increases or decreases sensory transmission is determined by the relative activity in large-diameter (A beta) and small-diameter (A delta and C) fibres and by descending influences from the brain. It is suggested that descending influences consist of attention, anxiety, anticipation and past experience - all of which may exert control over sensory input.[39]

### *2.2.3 Categories of pain*

Pain is usually classified into two major categories i.e. acute and chronic, based on speed of onset, quality and duration of the sensation. A distinguishing characteristic of acute pain is that it subsides as healing takes place, i.e. it has a predictable end and it is of brief duration, usually less than six months. Acute pain usually means sudden severe pain.[40] Post-operative pain is considered as acute pain.[41] Acute pain is characterised by a well-defined time of onset and is associated with both subjective and objective signs indicating activation of the autonomic nervous system. Acute pain usually resolves once the cause is removed and healing has occurred.[42] Chronic pain is prolonged, it is pain that persists beyond the usual healing phase of the disease process. Chronic pain is characterised by patient distress rather than pain.[43]

### *2.2.4 Surgical Pain*

Pain is an expected outcome of any surgical procedure. The pain of surgery is acute and begins with tissue damage that occurs as an incision is made. Various physiological responses are associated with acute pain.[44] The stress response initiated by the autonomic nervous system causes increased respiratory rate, increased cardiac output, elevated blood pressure, increased skeletal muscle tone, vasospasm of peripheral vessels and smooth muscle relaxation. Pain can cause emotions such as anxiety and fear, which also stimulate the autonomic nervous system. These physiological consequences of post-surgical pain, if allowed to reach a certain intensity, can lead to a number of complications.

High pain scores have been associated with an increased incidence of nausea. The mean pain scores of patients reporting nausea have been shown to be significantly greater than those not reporting nausea. The incidence of postoperative nausea and vomiting in females can be up to three times higher than in males.[45]

Quiet respiration may be relatively unaffected however the ability to deep breathe or cough is considerably diminished. Both vital capacity and functional residual capacity are substantially decreased.[46] These may lead to retention of secretions and may promote hypoxemia and respiratory infections. Pain impairs breathing and predisposes the patient to respiratory complications.[47]

Pain is often associated with tachycardia and hypertension. This may lead to myocardial ischaemia and infarction. Pain may slow the return of normal gut activity.[18]

### *2.2.5 Stress response*

The stress response to surgical trauma is in the form of generalised endocrine metabolic activation. Water retention can occur postoperatively as a result of increased vascular permeability and increases in antidiuretic hormone and aldosterone, whereas hyperglycaemia may be due in part to pain related increases in catecholamines and cortisol. Nitrogen balance may be adversely affected. Immunologic changes such as a decrease in lymphocytes and an increase in granulocytes can occur.[48]

The psychological effects of pain include both anxiety and fear.[49] Convalescence is slower and hospital stay is longer after poor pain control. Increased nursing attention is required. Consumer satisfaction is reduced and patients face further medical intervention with trepidation.[47] Severe pain reduces movement, increasing the risk of deep vein thrombosis and damage to pressure areas.[50]

***Summary***

Much is known about the physiology of pain yet conclusive definition of pain remains elusive. Post-surgical complications, as well as the humanitarian aspect of pain management, make it imperative that pain management becomes a priority for all health professions. Scott and Hodson[51] state that experiencing postoperative pain does not appear to confer any benefit on a patient except when severe haemorrhage occurs and that a pain-free state should be the desirable clinical endpoint for patients post surgery. Kehlet in 1993 said, "it has not been sufficiently appreciated that acute pain during the postoperative period not only serves no useful function but may actually exert physiologic and psychological effects if not adequately treated".[52]

# Chapter 3

## Pain Assessment and Documentation

This chapter describes the importance of pain assessment and the available types of pain assessment tools.

### *3.1 Need for pain assessment*

The purpose of pain assessment is to improve pain management by acting as a guide to the analgesic requirements of the patient. Reasons for pain measurement include (1) to determine intensity, quality and duration of pain (2) to aid diagnosis and (3) to evaluate the relative effectiveness of different therapies. Melzack said that the language of pain frequently provides the key to diagnosis and may even suggest the course of therapy.[53]

Mc Caffrey in 1983 said, "assessment of pain and its relief is no simple matter".[54] Acute pain is a common clinical situation encountered by nurses. Nurses have a direct responsibility for the provision of measures to relieve pain. Nurses are with patients during their recovery from surgery and when patients report the presence of pain. Monitoring pain control depends on the expertise of the individual nurse. Information on pain management can be difficult to relay and even more difficult for medical staff to evaluate.

Recent studies reviewing pain induced by surgery recommend interventions that may improve postoperative care. The British Working Party Report on pain after surgery

recommends several guidelines, including the fact that postoperative intervention can be assessed and improved only if some form of measurement of effect is made. The report suggests that the routine use of a simple pain assessment system, with treatment based on assessment is essential, if progress is to be made in the everyday management of pain after surgery.[18] This is supported by a study of acute pain in post-cholecystectomy patients. It found that no one member of the medical team was held to be responsible for pain management, thereby hindering the reduction of pain. The authors advised that the routine collection of pain measures would help to overcome this barrier.[55] Other studies of nurses' assessment of postoperative patients' pain also suggest that assessment of pain is integral to the planning and implementation of nursing care to relieve pain.[56] One such paper suggests that assessment of pain should be included in the regular recording of vital signs.[57]

Accurate pain assessment is essential for good nursing and medical care, for judging the status and progress of patients, the impact and efficacy of treatments and sometimes for reaching a proper diagnosis.[58] Current assessment and the recording of pain by nurses has been shown to be incomplete, inaccurate (often underestimated) and to describe location rather than severity of pain.[59 60 61 62]

The benefits of pain assessment tools were identified by the Burfield Nursing Development Unit which outlined four benefits gained from using a pain assessment tool. Firstly, the information obtained helps to establish the pattern of pain. Secondly, recording when analgesia is given and relating the level of pain with the timing and the type of medication helps evaluation of the effects of analgesia. Thirdly, including the patient in monitoring his

feelings of pain helps him to think more objectively about his pain and, fourthly, the assessment tool can help the nurse and the patient be more specific in goal setting. [63]

"The single most useful method for evaluating acute pain outside of the research environment - is the patient's self-report."[64] The pain chart is a tool developed to assist in the accurate measurement and documentation of patients' subjective pain. The difficulties that patients have in communicating their pain have been documented.[65] [66] Although existing pain charts may not be the ideal method for assisting patients to verbalise their pain their usefulness has certainly been well established. Anand [34] states that pain assessment must be designed to conform to the communication capabilities of the suffering person. The description of pain is a concern for both nurses and doctors, as the prescription, administration and evaluation of analgesics depends on the ability of the patient to adequately describe his/ her pain experience.

Pain is a complex multidimensional experience, which is difficult to quantify. Pain appears to have three main dimensions, a sensory, an emotional and an intensity aspect. Pain measurements range from laboratory research to clinical pain assessments. Clinical pain measures consist of behavioural measurements, observational data, self-reported behaviours and subjective pain reports. [67]

### *3.2 Subjective pain measurement*

Subjective pain reports extend from simple descriptive scales to detailed questionnaires assessing patients on various dimensions of the pain experience. The following is a review of

the main subjective pain measures available for acute pain measurement. The pain measures are divided into single dimensional and multidimensional measures.

### *3.2.1 Single dimensional measurements of pain intensity*

Single dimensional scaling methods can be used quickly. They require only minimal instruction to patients and are easily scored. Very sick patients are not taxed.[68] However most assume that patients are either literate or numerical, which may introduce difficulties for some individuals. Pain is treated as a single dimension only.

***Verbal/ graphic rating scale***

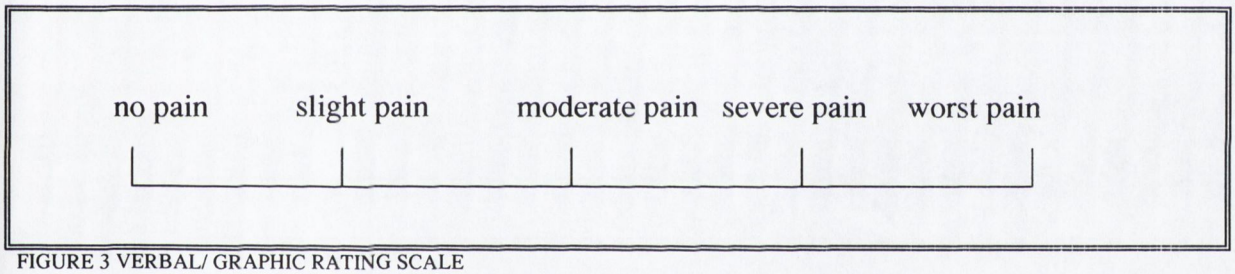


FIGURE 3 VERBAL/ GRAPHIC RATING SCALE

*Instructions to patient: circle one of the phrases, which best describes how your pain is feeling at the moment or mark with an X on the line.*

This type of scale generally comprises of 5 - 7 word categories. These word categories consist of descriptive pain words. The patient is asked to pick the word which best describes his/her pain. These words are then given a score. Pain is described in simple descriptive terms, measuring pain intensity. It is quick and easy to use with minimal explanations required.

There are limitations involved, however, as this method relies on the use of words. The difficulty is that it is necessary for the patient to translate a feeling into specific words, these words may not express exactly what the person is experiencing. Words can be ambiguous and

the same word does not necessarily mean the same thing to each patient. The Verbal Rating Scale has been described as reliable and valid but less sensitive than the Visual Analogue Scale (VAS).[69] It limits choices to 5 - 7 points and improvements in pain relief or effect of analgesic cannot always be measured due to the word restrictions.

***The four point verbal/ graphic rating scale***

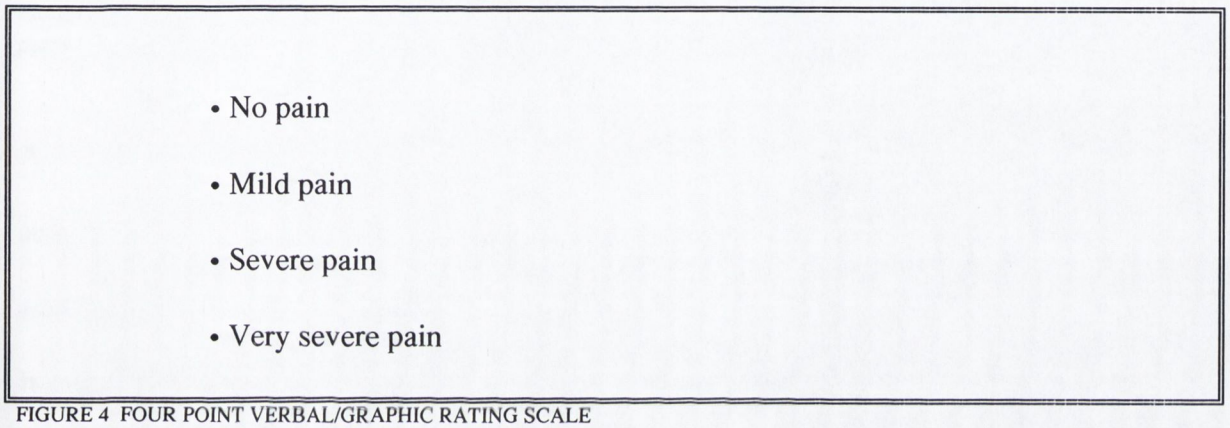


FIGURE 4 FOUR POINT VERBAL/GRAPHIC RATING SCALE

*Instructions to patient: Circle one of the phrases which best describes how your pain is feeling at the moment.*[70]

Descriptive rating scales consist of a list of adjectives, which describe different levels of pain. The least intense descriptor is given a score of zero, the next a score of one and so on. The patient's intensity score is the number associated with the word he/she chooses as most descriptive of his/her pain level. The descriptive rating scale can be given in verbal or written form. This tool uses simple descriptive terms, however it has limited response options for the patient.[71] It is easy to administer however it may be less sensitive due to the limited response options than other pain measures. It too relies on the use of words.

*Visual Analogue Scale*

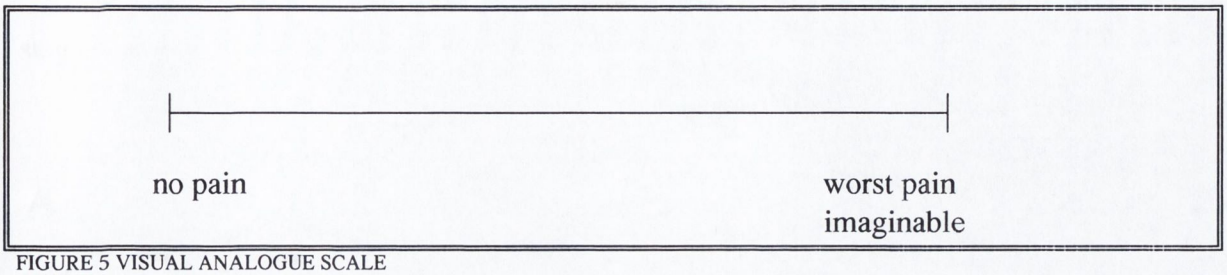


FIGURE 5 VISUAL ANALOGUE SCALE

*Instructions to patient: Identify by marking X on the line, how you feel your pain is at the moment (the more you move to the right-hand side the worse your pain is and the closer you are to the left-hand end of the line the less pain you are suffering).*

A Visual Analogue Scale (VAS) is a method of providing a simple way of recording subjective estimates of pain intensity. It had been described as sensitive in measuring pain and pain relief.[72] A VAS provides a continuous scale for estimation of the magnitude of pain. It consists of a straight line, the ends of which are defined in terms of the extreme limits of the pain experience. The scale conventionally a 10 cm long straight line may be printed either horizontally or vertically. Each end of the scale is marked with labels that indicate the range being considered.[73] Phrases such as "pain as bad as it could be" and "no pain" can be used. The patient is asked to place a mark on the line at a point representing the severity of his pain. Measuring the distance of a patient's mark from zero scores the scale. The scale requires only about 30 seconds to complete. A comparison of 5, 10, 15, and 25 cm lines suggested that the 10 and 15 cm lengths have the least measurement error and that the 5 cm line provided the greatest error.[74]

Factors, which may influence reliability and validity, are learning, memory and perceptual judgement.[75] The estimation of pain intensity with the VAS requires an ability to transform a

pain experience into a visual display, which involves perceptual judgement and accuracy. This perceptual ability is likely to influence the results, therefore the use of the VAS may not be possible in the elderly, the seriously ill or patients with organic brain disease.[76] It is suggested that as much as 7% of the population would not be able to use it.[77]

A number of steps are involved in the construction of the VAS. The sensation or response and the extremes of that response must be clearly defined. End phrases and descriptive words should be short, readily understood and not so extreme that they will never be employed. Definite cut-off points must be made for the line, which should be of a length that can be interpreted as a unit. Although verbal labels define end points of the VAS it is recommended that neither numbers nor verbal labels be used to define intermediate points, as this may cause a clustering of scores around a preferred digit. It is also preferable to present a VAS in a horizontal rather than a vertical format.[78] As the scale is continuous the restriction of a 3 or 5 point rating scale is overcome.

Comparisons of the VAS and the Verbal Rating Scale (VRS) suggest that the VAS gives a closer assessment of patient experience.[79] [80]

*Numeric Rating Scale*

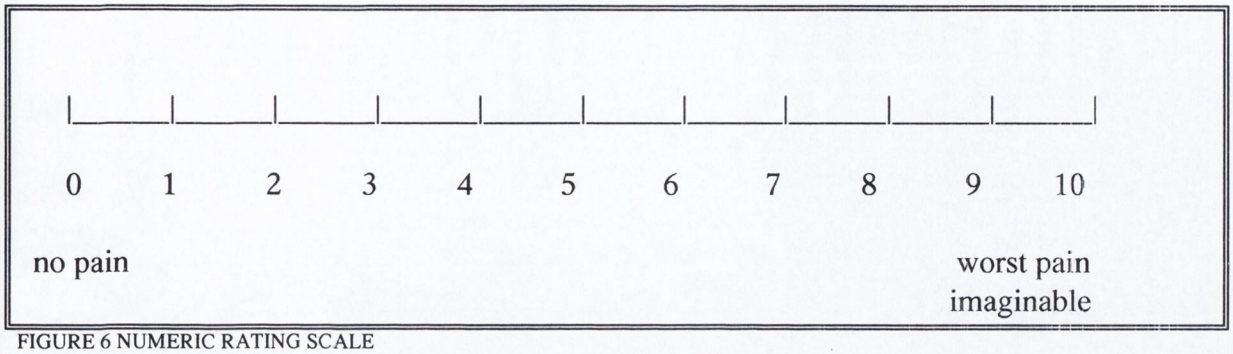


FIGURE 6 NUMERIC RATING SCALE

*Instructions to patient: Please mark with an X how bad your pain is at the moment.*

This is a variation of the VAS and consists of asking the patient to rate his/her pain on a numerical scale 0 - 10 with 0 equalling no pain and 10 equalling worst pain imaginable. It has been described as sensitive to change and may be preferred for statistical purposes. The numerical rating scale, like the VAS can be of varying lengths. The 101 cm length appears to have some advantages. It can be administered in verbal or written form. It has 101 response categories, which may overcome the limitations in response categories found in other scales. Difficulty with the scale does not appear to be associated with age.[72]

There may however be biases associated with this scale, some patients may have a preference or an aversion to certain numbers leading them to consistently choose or avoid this number.

***Pain Relief Measure***

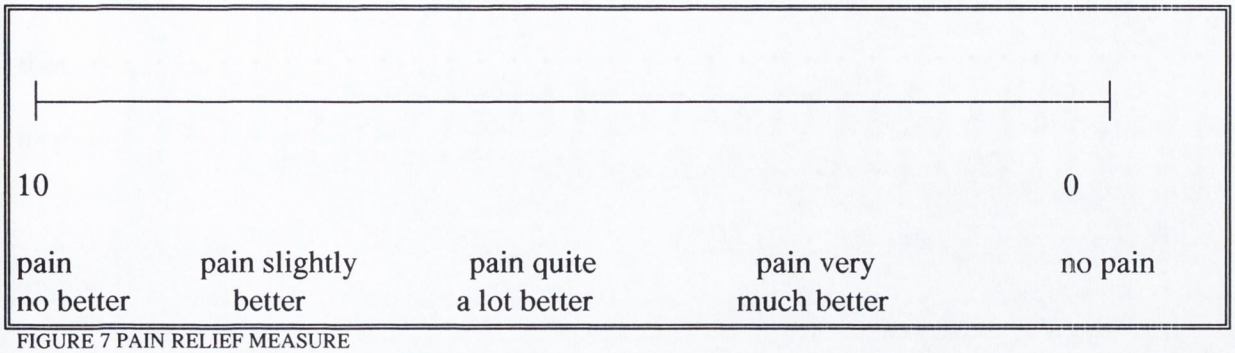


FIGURE 7 PAIN RELIEF MEASURE

*Instructions to patient: How effective were the pain killers you took? Circle the above phrase which best describes how your pain is now after taking your pain killer.*

The pain relief scale measures on a scale of 0-10 whether pain is reducing. This type of pain relief measure has been found it to be very sensitive to changes in pain intensity.[72]

### *3.2.2 Multidimensional measurements of clinical pain intensity*

Multidimensional scales involve subscales, which represent different aspects of pain. As with single-dimensional scales these scales also require a level of literacy and numerical skills.

#### *McGill Pain Questionnaire*

The McGill Pain Questionnaire (MPQ) comprises of a top sheet to record necessary medical information, line drawings of the body to indicate the distribution of the pain and word descriptors. The questionnaire consists primarily of 3 major classes of word descriptors - sensory, affective and evaluative - that are used by patients to specify subjective pain experiences. It contains an intensity scale and other items to determine the properties of the pain experience. The questionnaire was designed to provide quantitative measures of clinical pain that can be treated statistically. The 3 measures commonly used are (1) the pain rating index (pri) , based on two types of numerical values that can be assigned to each word

descriptor (2) the number of words chosen and (3) the present pain intensity (ppi) based on a 1-5 intensity scale, in which each number is associated with the following words: 1= mild, 2= discomforting, 3= distressing, 4= horrible and 5= excruciating. The pri is based on values assigned to each pain word chosen, which are added up for a total score.

The MPQ groups pain-related words into 3 major classes and 16 subclasses. The classes are firstly, words that describe the sensory qualities of the experience in terms of temporal, spatial, pressure, thermal and other properties, secondly, words that describe affective qualities in terms of tension, fear, and autonomic properties that are part of the pain experience and thirdly, evaluative words that describe the subjective overall intensity of the total pain experience.

Generally the questionnaire requires 15-20 minutes to complete. The MPQ firstly provides quantitative information that can be treated statistically, secondly, it is sufficiently sensitive to detect differences among different methods to relieve pain and, thirdly, it provides information about the relative effects of a given manipulation on the sensory, affective and evaluative dimensions of pain.

A reservation that has been expressed regarding the MPQ is that it is important for the interviewer to ensure that the patient understands the meaning of the words as some of the words may be beyond the patient's vocabulary. The MPQ has been more widely used in chronic pain than acute pain. It is suggested that acute pain involves less differentiation of

sensory, affective and evaluative language dimensions. [81] The length of time to administer the MPQ restricts its widespread use in ward situations where time is a precious commodity.

***Short form McGill Pain Questionnaire***

A short form MPQ (SF-MPQ) has been developed (Appendix 1). The main component of the SF-MPQ consists of 15 descriptors (11 sensory and 4 affective), which are rated on an intensity scale as 0 = none, 1 = mild, 2 = moderate or 3 = severe. Three pain scores are derived from the sum of the intensity rank values of the words chosen for sensory, affective and total descriptors. The SF-MPQ also includes the Present Pain Intensity (PPI) index of the standard MPQ and a Visual Analogue Scale. It compares well with the long form of the MPQ and provides some qualitative information as well as pain intensity information.[82]

This may be useful where qualitative information is important as well as pain intensity scores. It takes less time than the long form of the MPQ.

***3.3 Nurses' use and attitudes to pain assessment charts***

Documentation of nursing activities is an essential and integral part of care.[83] Nurses have always assessed pain however this assessment is often informal with minimal documentation. Briggs in 1998[84] reports that 57% of patients in her study did not have the problem statement of "pain post-surgery" documented within their documentation. Formal pain assessment, such as the use of a pain score or pain chart does not appear to be regular practice for nurses.[85 86 87] Field in 1996 reports that only 36% of nurses in her study had actually used a pain assessment chart.[88] An English survey (1993) of the use of pain charts in two hospitals showed a 50% and a 21% use of pain assessment charts respectively.[89]

In a follow up study to the Royal College of Surgeons and Anaesthetists report (1994) Windsor et al[90] surveyed all hospitals in the U.K. where surgery is performed. They discovered that 42.7% of U.K. hospitals have an acute pain service and that 82% of these use a pain score routinely.

From an Irish surgical ward perspective little literature was available. Mac Lellan[91], following a review of 136 patient charts in 1997 from a major Irish hospital, reports that 77% of patients did not have pain documented in either the nursing or medical notes. Pain in this study was considered documented if site, duration or intensity of pain were documented.

***Summary***

Although pain assessment tools, which are valid and reliable, are widely available they do not seem to have widespread use. In light of the disparities between nurses' and patients' reporting of pain it seems that the incorporation of a quantitative measurement of pain as part of regular patient care would be beneficial.

# Chapter 4

## Patients' and Nurses' knowledge of and attitudes to pain and its management

This chapter explores nurses' and patients' knowledge of and attitudes to pain management and how these may influence the way in which a patient's pain is managed. The reasons why nursing staff may be reluctant to administer and patients reluctant to accept analgesia will be discussed in relation to three main categories: firstly, a fear of undesirable effects of the analgesia including toxicity, addiction and respiratory depression, secondly, an inadequate knowledge of narcotic pharmacology and, thirdly, the acceptance of pain as part of the normal postoperative course. The author explores patients' attitudes and knowledge first and then nurses' attitudes and knowledge.

### 4.1 PATIENTS

It is reasonable to assume that while the patient, is a recipient of care he or she has an influence on how her/ his pain is managed. The author, having reviewed the relevant literature, divides this section into patients' knowledge of pain and analgesia, patients' expectations of pain, past experiences of pain, fear of addiction, lack of information and the expectation that the health professional responsible for their care will do and know best.

Schevde[92] in 1991 asked 800 patients, prior to surgery, to rate their concern about a number of issues related to their surgery. Post-operative pain was of highest concern for 34% of patients. This ranked just 2% higher than the issue of concern "patient becoming paralysed".

### *4.1.1 Patients' knowledge of pain and analgesia including expectations*

Kuhn (1990) suggested that the standard of postoperative pain relief is poor because of inadequate education of patient expectations.[7] Patients expecting to have pain after their surgery may make fewer demands and less reports of pain, making it a more difficult task to control. Owen in 1990[8] reported that 42% of patients expected moderate pain after their operation and that only 27% of patients expected complete relief from their analgesics. The majority of patients (65%) would wait until they had severe pain before asking for medication. Winefield[55] found that 60% of patients would wait to be given or offered another pain killer rather than asking for one. Weis showed that one third of patients believed that pain builds character[13] and Juhl[93] that only 64% of patients would always complain if they were in pain.

The results of Scott and Hodson's Scottish study (1997) of 515 patients highlighted the high degree of confidence the public has in the ability of nurses and doctors to treat postoperative pain.[51] The results of the study however indicate that patients themselves have very little knowledge. In their study 39% of responders considered that "if you are sore or in pain, your pain should not be taken away completely" with 24% unsure of the answer. There was no statistical difference in answers between sex, age or those who had undergone previous surgery. Forty six per cent of patients felt "you should put up with a bit of pain rather than complain". Eighty four per cent of patients felt that most hospitals are good at looking after pain after surgery. Hume in 1994[94] found that 47% of respondents believed that pain following operations was necessary and 38% thought that they would "just have to put up with it". In 1990[95] and in 1997 Carr[96] interviewed patients pre and post surgery. Although

both studies had small sample sizes (21 and 10 respectively) she found in both studies that all patients expected pain after surgery with the majority of patients under-estimating the intensity of the pain they actually experienced. Pellino[97] reports most patients pre-operatively anticipated a high amount of pain after surgery (orthopaedic n=172).

### *4.1.2 Addiction*

Both Lavies[98] and Winefield[55] in 1990 reported that 33% of patients believed that it was possible to become addicted to strong pain killers while in hospital.

### *4.1.3 Patients' experiences of pain*

Lavies[98] discovered that 44% of patients said, that pain was about as bad as they had expected and only 21% felt that it had been better than expected. Two thirds of the patients experiencing pain had gained either complete or a lot of relief from pain-relieving injections, 27% said some or little relief and no patient said that he had had no relief. The majority (42%) said that pain relief lasted 3-4 hours but a significant number said that relief lasted only 2 hours or less. Winefield[55] found that 30% of patients experienced pain worse than expected. Pain relief lasted less than 2 hours for 35%, 3-4 hours for 42% and more than 4 hours for 22%. When pain returned only 38% of patients asked for another injection rather than waiting for one to be offered.

### *4.1.4 Patients' attitudes to pain control*

Winefield[55] found that 56% of patients felt decisions about when they should receive more pain killers should be made by themselves, 20% by their doctor and 25% by a nurse. Laing[99] reports that 7% of patients did not think that postoperative pain relief was important, 36% thought that it was moderately important and 53% very important. Brydon[100] states that 5.6% of patients in his study of 180 patients reported that "in hospital one shouldn't mention that one is in pain".

### *4.1.5 Patients expect nurses to know when they have pain*

Seers reported that 42% of her patients expected the nurse to know when more analgesia is needed while 68% of nurses felt that patients would ask for a pain killer if they needed one.[101] Lavies[98] found that 60% of patients would wait to be offered a pain-relieving injection when pain returned.

### *4.1.6 Patients feel that they received adequate pain relief*

Weis[13] reported that 75% of patients reported that overall postoperative pain relief had been adequate, 18% inadequate and 7% unsure. Lavies[98] found that 92% of patients felt that they were generally satisfied with their pain relief.

### *4.1.7 Information re pain given to patients*

The following table 2 outlines experimental studies in the literature which indicate that information given re pain management to patients either pre or post surgery has an effect on analgesic consumption or on pain scores. The studies are for patients' following general

surgery who returned to a ward area (not Intensive Care or High dependency). Irish studies are reviewed in the next section. There is little evidence from the literature that information given re pain management to patients either pre or post surgery has a positive effect on analgesic consumption or on pain scores.

TABLE 2 STUDIES EVALUATING INFORMATION/ TEACHING GIVEN TO PATIENTS ON ANALGESIA OR PAIN SCORES

| Reference to study | Location of study | Study Population[a] | Timing of information/ teaching | Study design | Major Findings |
|---|---|---|---|---|---|
| Egbert 1964[102] | U.S.A. | N = 97 Elective abdominal surgery | Pre and Post operative[b] | R.C.T.[c] | • Day 1 post surgery no statistically significant difference in amount of narcotics given to patients<br>• Day 2 – 6 patients who received information received less narcotics (P<.01) |
| Healy 1968[103] | U.S.A. | N = 300 | Pre and Post operative | Experim-ental design | • Changed to oral narcotics earlier |
| Mogan 1985[104] | U.S.A. | N = 72 Elective abdominal surgery | Pre operative[d] | Experim-ental design.[e] | • Analgesic consumption showed no difference in the two groups<br>• Pain sensation showed no difference in the two groups |
| Hawkins 1993[105] | Australia | N = 60 Variety of surgery | Pre operative | Experim-ental [f] | • No significant differences in levels of pain or requests for analgesia |
| Schwartz-Barcott 1994[106] | U.S.A. | N = 91 Cholecystect -omy patients | Pre operative | Experim-ental design [g] | • No differences between three groups in pain scores |
| Hawkins 1997[107] | Australia | N = 60 Elective Gynaecology surgery | Pre operative | 3 sample independent groups[h] | • No significant difference in pain scores in group who were given specific information. |

a Number of patients in the study
b Information was given to one group re pain, analgesia, relaxation and movement
c. Randomised Control Trial
d. Relaxation techniques were taught to one group
e. Random assignment of pre-operative teaching
f. Three groups of patients, control, neutral and group shown an education video.
g. Three groups were in the experiment, group 1 received routine treatment model, group 2 received information model and group 3 received a facilitator model.
h Three groups were utilised, group 1 received routine hospital practices, group 2 received information via a video tape which gave specific advice about pain and group 3 received a video tape which presented public relations information about the hospital.

### *4.1.8 Information given to patients - the Irish literature*

The Irish Charter of Patient Rights states that patients have a right to information about their surgery and treatment.[108] The onus of information giving falls on the nurse, the doctor and the anaesthetist.

An interesting Irish study in 1996[109] showed that only 17.1% of patients felt that the anaesthetist learned something useful from their pre-operative visit. Patients in this study apparently had little concept of the need for anaesthetists to assess their airway and to independently assess risk factors pertinent to anaesthesia.

Martin[110] in 1996 followed 30 patients post surgery who were given information pre operatively. No significant difference in mean pain intensity in the two groups was found. Hayward[111] in 1971 hypothesised that those patients who were given information appertaining to their illness and recovery would, when compared with an appropriate control group report less anxiety and pain during the postoperative period. Pain was rated on a pain thermometer at five levels. He studied two hospitals and had an informed group and a control group in each hospital. In the first hospital although the informed group consistently had lower pain scores the only significant differences were for day 5 post surgery when informed patients were significantly recording less pain. In the second hospital the differences in pain between the informed group and the control group reached significance on both day 4 and day 5 post surgery. Hayward concluded that the results gave strong support to the idea that informed patients became relatively pain-free more rapidly than usual. Patients in both hospitals in the

informed group consistently received less analgesic medications. However this did not reach statistical significance on all postoperative days.

Boore[112] in 1978 tested the hypothesis that the pre-operative giving of information about prospective treatment and care, and the teaching of exercises to be performed post-operatively, would minimise the rise in biochemical indicators of stress. Pain scores were measured however there was very little difference to be seen between experimental and control groups and no significant results were obtained.

## 4.2 NURSES' KNOWLEDGE AND ATTITUDES

Nursing has a unique role in pain assessment and management. [113] Of all health professionals the nurse spends the most time with the patient in pain, assesses the patients' pain level and evaluates the information based on assessment. The nurse identifies the need for changes in pain relief methods, assesses the impact of pain relief and communicates the findings to the multidisciplinary team.[114] Studies report that nurses' perceptions of pain are different from patients' perceptions [115] [116] and nurses' perceptions are influenced by their own beliefs about suffering. [29] Several studies indicate that nurses possess inadequate knowledge about pain and hold inaccurate beliefs that contribute to the inaccurate decision making in pain management (table 3 and table 4). These surveys also show that nurses lack basic knowledge of opioids and equi-analgesic doses. Findings of the surveys indicate that nurses are overly concerned with addiction and respiratory depression with narcotic administration. Many nurses do not report that complete pain relief is a goal for them in pain management. Sofaer[117] [118]reports on a study aimed to assess the practicability and effectiveness of a clinically based

education programme for all levels of ward nurses on pain management. Interesting results show some reductions in pain.

Table 3 groups some of the major findings of several studies carried in the 1980s in relation to nurses' knowledge and attitudes towards pain and table 4 in the 1990s. There appears to be little change in attitude and knowledge from the 1980s to the 1990s. Comparisons, although interesting, must be made cautiously as studies had varying sample sizes, settings and methodologies.

TABLE 3 NURSES' KNOWLEDGE AND ATTITUDES TOWARDS PAIN 1980'S

| Reference to study | Location of study | Study Population[a] | Major Findings |
|---|---|---|---|
| Cohen 1980[10] | U.S.A.<br><br>6 surgical units of 5 general hospitals | N = 121 Registered Nurses<br><br>3 male<br>118 female<br><br>60 ≤ 2 years practice | • 3.3% identified complete pain relief as the goal of postoperative analgesia.<br>• 57.5% said the goal was to relieve just enough pain to function.<br>• 16.7% identified the correct likelihood of addiction with narcotic analgesia.<br>• 69.4% thought that narcotic analgesia is responsible for inadequate respirations on the day after surgery.<br>• 32.2% would wait for a patient with a PRN order to request pain medication on 2nd postoperative day. |
| Weiss et al 1983[13] | U.S.A.<br><br>Surgical, Orthopaedic & Gynaecolo -gical wards | N=70<br>49% response rate | • 21.4% indicated that the goal of postoperative analgesic treatment is complete pain relief.<br>• 31% indicated that a response to a placebo indicated that pain was not real.<br>• 41.4% identified the correct likelihood of addiction with narcotic analgesia.<br>• 25.7% knew that the chance of developing respiratory depression with narcotic analgesia is less than 1%. |
| Cartwright 1985[119] | United Kingdom | 211<br><br>70% response rate | • 57% said that they would not give prescribed analgesics when the patient is not in pain.<br>• 26% had reservations that the intramuscular analgesics given may cause addiction<br>• 61% said that they found that younger patients require more analgesia than older patients |
| Chapman et al 1987[120] | Australia<br><br>Acute hospital | N=86 | • 25% of nurses would wait until a patient was in severe pain before using a prescribed analgesic.<br>• 30% felt that the respiratory rate was the vital sign most affected by narcotic analgesics.<br>• 27% were concerned about the risk of postoperative analgesics causing addiction. |
| Watt-Watson 1987[121] | Canada Medical & neuroscience settings | N=106[b] | • 66% overestimated likelihood of addiction.<br>• 51% had incorrect knowledge of duration of action of morphine<br>• 82% believed that at equi-analgesic doses morphine had more side effects than meperidine or codeine |

a Number of nurses included in analysis, response rates are inclusive of all nurses asked to participate in the study

b Study included both graduate and student nurses, major findings are only presented for graduate nurses

TABLE 4 NURSES' KNOWLEDGE AND ATTITUDES TOWARDS PAIN 1990'S

| Reference to study | Location of study | Study Population[a] | Major Findings |
|---|---|---|---|
| McCaffrey et al 1990[122] | U.S.A.<br>Variety of settings | N=2459 | • < 25% identified the correct likelihood of addiction with narcotic analgesia.<br>• Nurses lack knowledge in classification of opioids ranging from 23% to 98% correct response across seven analgesic drugs. |
| Kuhn et al 1990[7] | U. K.<br>2 surgical & 2 gynaecol-ogy wards | N= 56<br>Response rate 60% | • 20% said that opioid analgesics may cause addiction<br>• 50% said that postoperative analgesia should relieve pain completely. |
| Winefield et al 1990[55] | Australia<br>Surgical wards | N=207<br>Response rate 67.2% | • 61.3% said that patients should be given more control over pain relief.<br>• 32.2% of nurses said that complete pain relief was the goal |
| Lander 1990[123] | Canada<br>Variety of settings | N=63<br>Response rate 53% | • Most nurses (68%) believed that addiction was very likely to occur with regular but short term administration of a narcotic.<br>• Nurses believed that 17.1% of patients would overuse analgesics if drug administration not restricted. |
| McCaffrey and Ferrell 1992[124] | U.S.A.<br>Variety of settings | N=1,781 | • 41% identified the correct likelihood of addiction with narcotic analgesia.<br>• 54% knew there is no ceiling on the analgesia of morphine.<br>• < 50% knew eqi-analgesic doses of narcotics. |
| Hamilton and Edgar 1992[125] | Canada<br>Acute care hospital | N=318<br>Response rate 54.7% | • 30.5% knew the likelihood of addiction with narcotic analgesics.<br>• 42.1% believed that changes in vital signs are necessary to verify severe pain.<br>• 85.5% reported the patient should rate their own pain intensity<br>• 41.5% knew that respiratory depression rarely occurs in patients receiving narcotics.<br>• 11% answered correctly the equi-equivalent dosing on the potency of oral to intra-muscular meperidine. |
| Lavies et al 1992[98] | Surgical units | N=209<br>Response rate 67% | • 55% responded that respiratory depression seldom occurs because of narcotics.<br>• 31% aimed to completely relieve pain when administering opioids.<br>• 65% knew the likelihood of addiction is <1%. |
| Brockopp et al 1993[126] | Acute care setting[c] | N= 65<br>Response rate 96% | • 79.4% agreed that opioid addiction is extremely low<br>• 14.1% agreed that the pain experienced by elderly patients post surgery is less than that for other age groups<br>• 43.5% did not agree that a painful state is unhealthy and often dangerous |
| Lloyd and McLoughlin 1994 [127] | United Kingdom<br>Variety of settings | N=269<br>Major teaching hospital | • 24% of junior day staff agreed that giving controlled drugs to a patient may result in addiction. |
| Brunier et al 1995[3] | Canada<br>Variety of settings | N=514<br>Response rate 51% | • Results indicated that nurses lacked knowledge and understanding of basic pain management principles, opioid usage and acute and chronic pain management.[b] |
| Hunt 1995[128] | United Kingdom<br>Orthopaedic | N=35<br>Response rate 70% | • 19 respondents were either unsure or agreed that care should be taken when using controlled drugs as patients can easily become addicted. |
| Clarke et al 1996[129] | U.S.A.<br>Variety of settings | N=120<br>Response rate 53% | • 16% rated the statement that addiction to opioids is as high as 25%.<br>• 1.7% agreed that a patient should request additional medication pain before |
| Briggs 1998[84] | U.K.<br>Orthopaedic surgery | N = 65 | • 34% of records identified pain as a problem post surgery. |

a Number of nurses included in analysis, response rates are inclusive of all nurses asked to participate in the study

b Authors were concerned about the accuracy of some of the responses to certain questions

c Questions related to elderly patients post surgery

In 1977 Hunt et al [130] stated that patients' expectations are low, as indicated by the unanimous praise for both doctors and nurses, despite in many cases their still being in pain. It seems that Scott and Hodson's 1997[51] study seems to saying the same thing twenty years later. Harmer[131] states that ongoing education of medical and nursing staff is essential to improve the care of patients, but it is equally important to educate the patient, after all they are suffering the pain.

***Summary***

The literature indicates that there is an urgent need to recognise nurses' lack of basic knowledge and to put measures in place to rectify the situation. Unless nurses become more knowledgeable about pain management patients will continue to experience moderate to severe pain post surgery despite recent advances in pain management. Sullivan 1994[114] states that pain management cannot be effective if its implementation is based on inadequate knowledge and erroneous beliefs. The review of the literature suggests that the importance of both the patient and the nurse in pain management is being underestimated and undervalued.

# Chapter 5

## Surgical pain management

### 5.1 INTRODUCTION

The objectives of postoperative pain control should be to minimise discomfort, facilitate recovery and avoid treatment-related side effects.[132] Management of surgical pain is complicated and challenging because of large variations in pain experience, analgesic requirements and the many techniques available to treat postoperative pain.[133] The choice of the most appropriate method to manage pain will be governed by the nature of the surgery, the intensity and expected duration of the pain, the availability of the drugs and expertise and patient factors such as illness, age and psychological state.[47] Patients vary greatly in their medical conditions and responses to surgery and procedures, responses to pain and interventions and personal preferences. Therefore rigid prescriptions for the management of pain are inappropriate.[134]

Pharmacological intervention is the mainstay in the management of acute pain management, although non-pharmacological approaches provide good adjunctive therapy in many cases.[135] The U.S.A. agency for health care policy and research[66] recommends an integrated approach to pain management and state that Pain Control Options should include:

- Cognitive-behavioural interventions such as relaxation, distraction and imagery: these can be taught preoperatively and can reduce pain, anxiety and the amount of drugs needed for pain control;
- Systematic administration of non-steroidal anti-inflammatory drugs (NSAIDs) or

opioids using the traditional "as needed" schedule or round-the-clock administration;

- Patient Controlled Analgesia (PCA) usually means self medication with intravenous doses of an opioid; this can include other classes of drugs administered orally or by other routes;
- Spinal analgesia, usually by means of an epidural opioid and/ or local anaesthetic injected intermittently or infused continuously;
- Intermittent or continuous local neural blockade (examples of the former include intercostal nerve blockade with local anaesthetic or cryoprobe; the latter includes infusion of local anaesthetic though an interpleural catheter);
- Electroanalgesia such as transcutaneous electrical nerve stimulation.

This chapter explores pain management from two aspects: the pharmacological management of pain (5.2) and the influence of structured pain approaches including the introduction of acute pain services and pain teams (5.3). Types and mode of analgesia are discussed with reference to analgesia suitable for the surgical ward area.

## 5.2 PHARMACOLOGICAL MANAGEMENT OF POSTOPERATIVE PAIN

The following section reviews the literature in relation to the pharmacological management of pain. The Royal College of Surgeons and Anaesthetist's Report[18] recommends that pain and its relief should be discussed with the patient, both before and after surgery and that there should be an emphasis on prevention. Pharmacological management of mild to moderate postoperative pain should begin unless there is a contraindication with a NSAID. Moderately severe to severe pain should initially be treated with an opioid analgesic. [134] The concurrent use of opioids and NSAIDs often provides more effective analgesia than either classes alone.

### *5.2.1 Non-Steroidal Anti-Inflammitories (NSAIDs)*

NSAIDs act by decreasing prostoglandin production by inhibiting the production of the enzyme cyclo-oxygenase. NSAIDs have analgesic, antipyretic, anti-inflammatory and antiplatelet actions.[136] NSAIDs, for example Ibuprofen, Indomethacin, Diclofenic Sodium are particularly effective in relieving pain associated with inflammatory conditions. NSAIDs alone can achieve excellent pain control.[137] [138] NSAIDs have been shown to have considerable opioid dose sparing effect and thus may be useful in reducing opioid side effects.[139] Complications associated with NSAIDs are upper gastrointestinal haemorrhage[140], renal toxicity, inhibition of platelet aggregation and possible allergic reactions.[141] NSAIDs do not cause physical dependence or addiction.

### *5.2.2 Opioids*

Opioids form the cornerstone of the pharmacologic armoury for the treatment of pain[142] and are often the drugs of choice in the first line management of acute pain.[135] Opiates come from the seed capsule of the opium poppy (Papaver somniferum). Opioids are derivatives of opium and include naturally occurring opium derivatives, partially synthetic derivatives of morphine and synthetic compounds.[143] Specific binding sites for opioids in the brain were discovered in 1973.[144] Opioid receptors are found in the limbic system of the brain, the hypothalamus and in the dorsal horn of the spinal cord in the areas associated with the sensory processing input from the C and A delta fibres which are important in pain transmission. As opioid receptors are activated they mediate two functions: chemical recognition and physiologic action.[142] A number of other activities occur at the same time as the analgesic effect. These other activities comprise the common side effects as listed in table 5. The potency or intensity of the

analgesic effect is dependent upon: (a) access to the receptor and (b) binding affinity at the site.[142]

TABLE 5 OPIOID RECEPTORS AND THEIR ACTIONS

| OPIOID RECEPTORS | ACTION |
|---|---|
| Mu 1 | Analgesia |
| Mu 2 | Respiratory depression, euphoria, physical dependence, constipation |
| Delta | Analgesia |
| Sigma | ANS stimulation, dysphoria, hallucinations |
| Kappa | Analgesia, sedation |
| Epsilon | Analgesia |

The Royal College of Surgeons and Anaesthetists report[18] recommends that in order to improve the efficacy of opioid administration, the dose and frequency should be adjusted in response to the needs of each patient who should have an individualised treatment regimen. Efficacy and side-effects should be recorded regularly and treatment modified accordingly.

## 5.3 ROUTES OF ANALGESIA

It is possible to administer analgesia via many routes but some are more effective than others in the control of postoperative pain. Conventional treatment continues to be via the intra-muscular (I.M.) route on an as needed (P.R.N.) basis. The main advantages and disadvantages of the main routes of administering analgesia will be discussed in the next section. Pharmokinetics describes the uptake, distribution and elimination of the drug. There is wide variation between individuals and sometimes within the same individual at different times. Following an I.M. injection, peak concentration, time-to-peak concentration and the duration of effective blood concentration may vary at least by a factor of five.[145] Non-parenteral routes are subject to even greater variability in absorption. Patient characteristics which may influence analgesic pharmacokinetic variability include age (elderly have a diminished volume of distribution), hepatic disease, renal disease, acid base balance, hypothermia, hypothyroidism and concurrent drug administration.[47]

### *5.3.1 Traditional I.M. analgesia*

This is the commonest parenteral route used for the administration of opioid drugs on hospital wards. The standard analgesia prescription is usually for intramuscular injections of an opioid analgesic given four-hourly as required. Problems that reduce efficacy include slow onset, variable blood concentrations and delays in nurses' response time. Large bolus doses of I.M. narcotics separated by several hours cause fluctuating blood levels, which lead to alternating periods of sedation and inadequate analgesia.[146] Advantages include simplicity and economy.

Nurse-administered intermittent opioid injection requires good staffing to minimise delay between need and injection.[6]

### *5.3.2 Intravenous route (IV)*

The intravenous route is the most important route for analgesic drug administration in the treatment of acute pain.[66] Its advantages include the immediate access of the drug into the circulation, ensuring complete availability and rapid onset of action. The IV route is effective for either bolus dosing or continuous infusions. Peak action is achieved quickly (15 - 30 minutes for morphine) and the variability of absorption associated with I.M. injection is eliminated.[44] Disadvantages include the need to secure intravenous access and the maintenance of this access for prolonged periods and the need for medical staff or specially trained nurses to be available to administer intravenous boluses.

### *5.3.3 Patient-Controlled Analgesia (PCA)*

Active involvement of the patient in the management of postoperative pain by the use of PCA has been introduced into clinical practice over recent years.[147] The PCA system consists of a syringe pump and a timing device. The patient activates the system by pressing a button, which causes a small dose of analgesia to be delivered into the venous circulation. Simultaneously a lockout device is activated, ensuring another dose cannot be delivered until a time pre-set by the Anaesthetist/ Pain Team.

The PCA systems currently available have the following features: bolus demand dose, lockout interval, background infusion and maximum dose. The bolus demand dose is a

predetermined dose, which is delivered by the machine when the patient presses the button. When determining the size of the bolus dose, anaesthetists select an amount that will produce analgesia with minimum side-effects. The lockout interval is the period after a dose has been given, during which time further demands made by the patient are ignored by the machine. Most machines allow a background infusion of a drug to be delivered to the patient independent of patient demand. A background infusion is thought to be necessary to avoid sleeping patients being woken by pain and needing to make several demands to re-establish pain control.[148] Drugs commonly used in PCA systems include Morphine, Pethidine and Fentanyl.

There are conflicting opinions as to the efficacy of PCA.[149] Lange[150] reports a significant reduction in the postoperative pulmonary complication rate with the use of PCA. The overall incidence of potentially life-threatening complications with PCA has been reported as low. [151] [152]

Bennett[153] in 1982 reported less analgesic drug use with PCA. Snell et al[154] report a comparison of PCA and intramuscular injections showing no statistically significant difference in amount of pain, amount of analgesia use, degree of patient satisfaction with pain control, length of time to first ambulation and length of stay in hospital. The PCA patients took on average 4-5 hours longer than the I.M. patients to ambulate postoperatively. McGrath[155] in a study of 88 patients showed no statistical difference for pain scores between the PCA group and intramuscular meperidine group however PCA patients received significantly less meperidine in the first 24 hours. Patients showed more enthusiasm for PCA.

Passchier et al[156] reported that PCA gave significantly more pain relief however patients suffered from more fatigue and showed less vigour than an I.M. morphine group. Knapp-Spooner[157] also reports less pain on day 1 although sample size is small. Thomas[158] reports PCA patients receiving significantly less analgesia and being discharged earlier as compared to an I.M. group. Ferrante[159] reports no difference in efficacy of pain relief between PCA and IM analgesia.

Jones[160] costed PCA higher than conventional I.M. analgesia however he stated that cost must be weighed against patient satisfaction. Choiniere[161] also costs PCA as higher and found no clinical advantages with the use of PCA.

In a study of patients' attitudes to PCA, it was interesting to note that patients felt that PCA gave a distinct advantage in that it meant the nurse did not have to be bothered. Patients perceived their pain as less important than other nursing activities.[162] Patients in some studies expressed fear of overdose.[163]

Both Collins[164] and Perry [165] showed that the majority of patients expressed a preference for PCA as a method of administration of analgesia. However neither had comparison groups in the studies.

The main advantage of a patient controlled analgesia is that it is a system that is designed to accommodate the wide range of analgesic requirements that can be anticipated when managing acute pain. It can also minimise the anxiety resulting from the slow onset of pain

relief associated with most commonly used modalities.[166] Control over pain relief is cited in a number of studies as an advantage.[167] [167]

### *5.3.4 Oral Route*

If a patient is tolerating fluids there is no reason why severe pain cannot be treated with oral opioids.[134] There is little difference in the onset of pain relief via the oral and intramuscular route however dosage is a significant factor.[135] Potent analgesia can be administered orally.[168]

### *5.3.5 Epidural analgesia*

The spinal epidural space extends from the sacral hiatus to the base of the skull. Drugs injected into the epidural space can then block or modulate afferent impulses and cord processing of those impulses. Both epidural local anaesthetics and epidural opioids can produce analgesia.[169]

Epidural analgesia is indicated for the provision of postoperative analgesia.[170] However the use of epidurals involves specially trained nurses in order to provide the necessary observation and patient management.[171] This is not regularly feasible in a general surgical ward situation.

### *5.3.6 Conclusion*

Analgesics have been the cornerstone of postoperative pain management for years.[44] Moote recommends that [172] the solution to improved postoperative analgesia lies in the exploitation and liberalisation of traditional analgesic drugs and techniques. She recommends that combined analgesia with NSAIDs and opioids should be used and that when the patient is able to tolerate oral fluids the oral route should be used. She highlights the role of the nurse [173] indicating that the potential of nurses to relieve pain cheaply is under-utilised due to the typical prescribing patterns post surgery the "Morphine 10mg I.M. P.R.N.". She says that the solution is straightforward - give more and give it more often. Conno et al[174] supports this by reporting in their study that when pain was treated with analgesia given intramuscularly at fixed hours patients had significantly better pain control than the patients treated with drugs "on demand". The nurse can fail with this approach because of ignorance, inexperience, tradition, overwork and unfounded fears of addiction and respiratory depression while controlled drug regulations impede further.[47] Chapman[121] reported that 98% of nurses felt that there was a distinct advantage in using flexible prescriptions. Fifty six per cent of nurses felt that prescribing patterns of doctors were inconsistent and 88% that writing could be improved (Cartwright[120] reported 90%). Forty per cent of nurses indicated that the anaesthetist was the person most appropriate to manage postoperative pain relief.

Amours and Ferrante[175] state that satisfactory relief from postoperative pain can be achieved for the vast majority of patients. Most patients can be adequately treated with proper combinations of commonly-used agents such as NSAIDs and Opioids. Because of widely varying analgesic requirements, proper dosages must be carefully determined for each patient.

### *5.4 Drug prescription and administration trends*

Juhl[93] in 1993 found that 91% of patients had analgesia prescribed pro re nata (P.R.N.) and that only 4% of patients had analgesics prescribed for regular use. He found that on average patients received 70% of the maximally prescribed dose of analgesic during the first 24 hours and an average of 43% during the following day. Owen[8] reported that 77% of patients were prescribed P.R.N. analgesics.

Sriwatanakul[176] found that patients received 70% of the maximum ordered dose in the first 24 hours and 43% in the second 24 hours. Forty two per cent received morphine sulphate and 58% meperidine hydrochloride. Semple[177] in 1991 reported that omnopon was the most commonly-used opioid (41% of units used it). Eighty seven per cent of I.M. analgesia was on a P.R.N. basis. Cartwright[178] found that traditional I.M. analgesia accounted for 51.6% of postoperative analgesia. Sixteen per cent of this was regular administration and 84% P.R.N. Omnopon was the commonest opioid used I.M. Boer et al[179] found that the prescribed daily dose of morphine was only received by 4.2% of patients. Oates[180] reports those patients with moderate and severe pain received only 36% of their prescribed analgesics.

A small study in Edinburgh in 1990[50] found that analgesics were given approximately half as frequently during the night as compared to during the day. S Jose Closs in 1992 [181] examined patterns of analgesic provision and found that the number of doses given peaked at two points during the 24-hour cycle. The highest number of doses were give between 8 a.m. and 12 noon and 8 p.m. and 12 midnight. Fewer doses were given at night between midnight and 4 a.m. In the study pain was found to be the most commonest form of night-time sleep disturbance with

analgesics helping more patients to get back to sleep than any other intervention. Almost 50% of patients said that their pain was worse at night. Analgesic provision at night, therefore, did not appear to be explicitly related to need. Of those prescribed intermittent opioids (n=79) they received 23 ± 2% of their theoretical maximum dose.

The only Irish study located[91] reports that in a review of 136 charts 97% of patients were prescribed more than one analgesic. Mean number of doses of analgesia administered daily varied from 1.4 to 3.2. Mean amount of analgesia administered varied from 4% to 41% of the maximum possible for the first five days post surgery.

The literature, as highlighted above, continues to show differences of opinion in relation to nurses' and doctors' perception of optimum drug prescription and administration. All of this, perhaps, leads towards pain management, which leaves much to be desired. The next section reviews the literature available to date in relation to the idea of using a multidisciplinary structured approach to pain management post surgery.

## 5.5 ROLE OF ACUTE PAIN SERVICES

In 1988 Ready et al [182] drew attention to the potential role of an acute pain service (APS) by developing an anaesthesiology-based postoperative pain management service. They said, "just as chronic pain management has become a special area of medical practice, treatment of acute pain deserves a similar commitment by practitioners with special expertise". They pointed to anaesthesiologists as the logical choice to provide pain relief in the immediate post

operative period. Reasons cited were that anaesthesiologists are familiar with the pharmacology of analgesics, are aware of the short and long term effects of drugs given intra-operatively, are knowledgeable about pain pathways and their interruption and are skilled in the techniques needed to offer multiple forms of pain control. The goal they set for the APS were, firstly, to improve postoperative analgesia, secondly, to train anaesthesiology residents in methods of postoperative pain management, thirdly, to apply and advance new analgesic methods and, fourthly, to carry out research in the area of postoperative pain management.

Wheatley et al[183] defined the Acute Pain Service as being responsible for the training of medical and nursing staff, organisation of services to provide adequate levels of care, audit and evaluation of new and existing methods of treatment and undertaking clinical research into postoperative pain management.

The following section reviews the available published literature in relation to acute pain services. There is, at the time of writing, only one published article reporting the introduction of an acute pain service in a general hospital in the Republic of Ireland.[184] In this study the team report a significant improvement in the quality of care for patients post surgery however there was no quantitative evaluation reported.

It is of interest that a number of evaluations of acute pain services are becoming available both from the U.K., from the U.S. A., from Australia and New Zealand.

To date the literature describes organised acute pain services set up by and run by an anaesthetic service however there is one study by Mackintosh[185] (1997) evaluating a nurse-led acute pain service. Macintyre[186] describes the first year of an Australian Acute Pain service. The hospital introduced education, policies and protocols, standing orders, pain scores and acute pain service rounds. The occurrence of major complications was low and patient satisfaction with the service was high.

Cartwright et al[120] outlines the first year of an acute pain service in a new district general hospital. The organisation of the service was the responsibility of named consultant anaesthetists. The service also had a senior and junior doctor available day and night with no commitments other than emergencies. Its methods are as follows:

- Publication of a single sheet describing the aims and objectives of the APS;
- Regular meetings with the sisters;
- Demonstration of PCA pumps;
- Education in the School of Nursing;
- Pre-operative A5 Leaflet giving information to patients;
- Follow up postoperatively by anaesthetic round;
- Audit and documentation of pain scores and postoperative analgesia;
- Patient satisfaction studies.

A year into the service they have reported a decrease in the number of patients suffering from severe postoperative pain and an increased referral rate by surgeons and physicians for other pain problems.

Wheatly et al[183] describe the benefits, risk and resource implications of providing an acute pain service. They define the APS as being responsible for the training of medical and nursing staff, organisation of services to provide adequate levels of care, audit and evaluation of new and existing methods of treatment and undertaking clinical research into postoperative pain management. At the end of a year they say that their daily audit of the service and feedback to the anaesthetic and surgical colleagues had led to the delivery of a more consistent standard of postoperative care.

In 1992 Gould et al[187] outlined the effect of sequential changes in a policy for controlling pain after surgery. Their objective was to observe the effects of introducing an acute pain service to the general surgical wards of a large teaching hospital. The study design had seven stages: an audit of current hospital practice succeeded by the sequential introduction of pain assessment charts to the general surgical wards, an algorithm to allow more frequent use of intramuscular analgesia, increased use of local anaesthetic techniques of wound infiltration and nerve blocks, an information sheet for patients about postoperative pain, the introduction of patient-controlled analgesia and repeat audit of hospital practice. Over a nine month period 2035 patients were audited 24 hours after operation. Main results showed a reduction in median visual analogue pain scores 24 hours after surgery for pain during relaxation, pain on movement and pain on deep inspiration. The authors of the study concluded that the introduction of an acute pain service to the general surgical wards led to considerable improvement in the level of postoperative pain as assessed by visual analogue scores.

In 1993 Schug and Haridas[188] detail the development and organisational structure of an acute pain service in a major teaching hospital. Again this is an anaesthesia-based service. The primary objective of the APS is to improve postoperative analgesia both in quality of analgesia provided and in the range of analgesic techniques used. The APS was established in 1989 and it took nearly eight months to implement the service to the whole hospital. The following is a list of the stages that the development took:

- Evaluation of the necessity for an APS;
- Selection of techniques;
- Co-operation with other services;
- Acquisition of funding and equipment;
- Recruitment of staff;
- Development of protocols, order and observation forms;
- In-service training of nurses;
- Trial on one ward;
- General use of revised technique;
- Ongoing quality assurance and in-service training.

A senior nurse specialist works part-time with the service and is essential in establishing guidelines, nurse education and on-going liaison with the nursing service.

In 1994 Rawal and Berggren[189] said that it is being increasingly recognised that the solution to the problem of inadequate postoperative pain relief lies not so much in development of new techniques but in the development of a formal organisation for better use of existing techniques. They describe a nurse-based anaesthesiologist supervised model of APS based on the concept that postoperative pain relief can be greatly improved by provision of in-service

training for surgical nursing staff, optimal use of systemic opioids and use of regional analgesia techniques and PCA in selected patients. The APS introduced regular recording of each patient's pain intensity by visual analogue scale (VAS) and recording of treatment efficacy on a bedside vital signs chart. A VAS greater than 3 is promptly treated. Surgeon and ward nurse participation are crucial. An Acute Pain Nurse (APN) makes a daily round of all surgery departments. Her duties include referral of problem patients to the anaesthesiologist. The hospital performs 18,000-20,000 surgical procedures each year, this low cost regime($3-4/ patient) is designed to benefit all patients.

Mackintosh (1997) evaluated the impact of a nurse-led acute pain service. The evaluation focused on three areas of concern; pre-operative information, patients' self-reported levels of pain and analgesics prescribed. The results of evaluation indicate significant reductions in reported levels of pain and patterns of analgesic prescribing.

Pesut[190] evaluated the effectiveness of an acute pain service in Canada. No significant differences in mean pain scores were noted following the introduction of the pain service.

Tighe et al[191] (1998), following introduction an acute pain service whose emphasis was on multimodal pain therapy, reported that the service significantly improved in-patient perception of pain relief upon return of consciousness after anaesthesia and for two days postoperatively. They report no changes in the incidence of emetic sequelae. They found a significant improvement in patient satisfaction and sleep pattern in hospital.

## 5.6 OVERVIEW OF ACUTE PAIN SERVICES TO DATE

In 1998 Harmer[192] reported on the effect of education, assessment and a standardised prescription on postoperative pain management following a clinical audit of 15 hospitals in the United Kingdom. He reported that following the introduction of the above there was an overall reduction in the percentage of patients who experienced moderate to severe pain at rest from 32% to 12%. The incidence of severe pain on movement decreased from 37% to 13% and moderate to severe pain on deep inspiration from 41% to 22%. He also noted decreases in the incidence of nausea and vomiting.

In relation to the safety of acute pain services, Schug[193] reported no serious complications in morbidity and mortality in a study of 3016 patients receiving care from an acute pain service. Tsui et al[194] audited 2509 patients under the care of an APS. They documented all side-effects and complications that occurred. They concluded that a standard monitoring and management protocol, an experienced nursing team and a reliable APS coverage is mandatory for the safe use of modern analgesic techniques.

In 1995 Harmer et al[195] undertook a survey of the current status of acute pain management in the UK by means of a questionnaire sent to each of the tutors of the Royal College of Anaesthetists. Forty four per cent of responding hospitals reported having some form of acute pain service. Of these 28% employed a specific pain nurse and 16% had specific "fixed" consultant sessions allocated to acute pain.

In 1996 Davies[196] reported on a U.K. national survey of acute pain services. She stated that the structure of acute pain services varied greatly. Nursing and medicine were the only disciplines involved in the majority of services.

Windsor also in 1996 in the UK undertook a postal survey of all hospitals in the UK where surgery is performed. She found that 42.7% of hospitals had a multidisciplinary acute pain service in place by 1994. Routine assessment of pain occurs in 82% of the hospitals with an acute pain service.[90]

Warfield[197] surveyed 300 U.S.A. hospitals in 1995. She found that 42% of hospitals had acute pain management programs and that an additional 13% had plans to establish and acute pain management program. A survey of APS in Canada (1993) showed that 53% of hospitals were operating one.[198]

The literature indicates that since the advent of the acute pain team/ service in 1988 this approach to acute pain management appears to have become popular worldwide. The results of audits of the effectiveness of these services appear very positive. It will be of interest to note how Ireland responds to such initiatives.

# Chapter 6

## The relationship of acute surgical pain management to nursing theory, nursing models and nurses' clinical decision making

This section aims to explore nurses' clinical decision making, nursing theory and nursing models (many of which are based on nursing theory), and relate them to acute surgical pain management. Nursing theory is explored first (section 6.1) and reference is made specifically to one nurse theorist, Virginia Henderson. Section 6.2 discusses nursing models and section 6.3 nurses' clinical decision making. Three models are described (Orem's model, Roper, Logan and Tierney's model and Roy's model). Acute surgical pain is conceptualised within these models.

### 6.1 NURSING THEORY

Consideration and conceptualisation of nursing is generally considered to begin with Florence Nightingale. Nightingale[199] in her Notes on Nursing (1859) said that the very elements of what constitutes good nursing are as little understood for the well as for the sick and that nursing has been limited to signify little more than administration of medicines and application of poultices. However Nightingale felt that nursing ought to signify the proper use of fresh air, light, warmth, cleanliness, quiet and the proper selection and administration of diet.

Barnum (1994)[200] describes theory as a construct that accounts for or organises some phenomenon; a nursing theory thus describes or explains nursing. Theory is described as the map of the territory with different theories using different maps, that is diverse components and relationships assume importance in disparate theories. A theoretical

framework provides a way of looking at nursing phenomena. It contains specific ideas or words, called concepts, which a nurse draws on to use in direct patient care as well as for making administrative decisions. [201]

Draper proposes four roles for nursing theory, which are; to define nursing by describing nursing phenomena, to form a realistic basis for curriculum design, to provide tools for the professional practice of nursing and to provide a nursing language.[202]

Hunink[203] likens the amount of theories described, analysed and referred to as a jungle, which can make it hard to see the wood from the trees! However, he says that in spite of the wide variety in nursing theories a degree of similarity can be found in the following points; a more holistic approach, formulating a domain of nursing, a more patient-centred approach, the different stages of care are organised in a Nursing Process and attention is paid to the four elements. The need to describe and the difficulty in describing nursing phenomena has persisted all through this century and seems, as yet, unresolved. The particular difficulties may centre on the diverse and dynamic nature that is nursing.

McKenna says the attempts to theorise in the 1960's, led to a desire to define what nursing is. He questions as to how correct the unique definitions of fifteen nurse-theorists can be.[204] Virginia Henderson said, about language in nursing, that not much has really changed only the language used to describe it has changed.[205] Henderson commented that to promote a universal definition of nursing was too difficult due to the disparate nature of nursing. [206] Henderson's definition of nursing reads as follows:

*"The unique function of the nurse is to assist the individual, sick or well, in the performance of those activities contributing to health or in its recovery (or to a peaceful death) that he would perform unaided if he had the necessary strength, will or knowledge. And to do this in such a way as to help him gain independence as rapidly as possible"*. [207]

Henderson acknowledged that the concept of the nurse as a substitute for what the patient lacks to make him "complete", "whole" or independent may seem limited to some. [208] However she said that the more one thinks about it, the more complex the nurse's function as so defined proves to be. Henderson identified 14 basic needs of the patient, which comprise the components of nursing care. These include the need to: breathe normally, to eat and drink adequately, to eliminate body wastes, to move and maintain desirable position, to sleep and rest, to select suitable clothes, to dress and undress, to maintain body temperature, to keep body clean, to avoid dangers in the environment, to communicate, to worship according to one's faith, to work in such a way that there is a sense of accomplishment and to play and learn.[209] Henderson claims that the nurse should always acknowledge that the need patterns of the patient have to be met and that the nurse should try to put herself in the position of the patient as much as possible. [210] Henderson commented in 1991, following years of reflection on the nature of nursing that "nursing is primarily complementing the patient by supplying what he needs in knowledge, will, or strength to perform his daily activities and to carry out the treatment prescribed for him by the physician". [211]

Halloran considers that Henderson's writings are the 20th century equivalent of Nightingales 19th century Notes on Hospitals.[212] McKenna comments however that

empirical information on nursing theories is conspicuous in its scarcity and that as a result there is little research evidence pertaining to its application let alone the evaluation of nursing theories. [213]

## 6.2 NURSING MODELS

The invention of nursing models, it seems, was based around the notion of finding a fruitful way of beginning to think theoretically about nursing. [214] The development of nursing models proliferated mid last century with the 1950's and 1960's seeing the debate as to "what is nursing" begin in earnest. This debate centred on theoretical statements, which are considered today as nursing conceptual models. A model however is not a theory but theory can assist the construction of a model. [215] The approach of using models of care to describe nursing began in the United States and spread world-wide over a thirty-year period. It was in the eighties when the use of the nursing process based on a model of care became more of a norm in the Irish healthcare setting. However the semantic looseness of the words, "theory" and "model" in the literature can serve to cause confusion.[216]

Nursing models have been variously referred to as philosophies, conceptual frameworks, paradigms, theories and metatheories. [214]

A model has been described as a statement, which causes nurses to perceive patients, their environment and their health/ illness statement in a specific way. It influences the way in which nurses understand and interpret the aetiology of pathology and of nursing needs, how these needs are identified and how appropriate nursing intervention is selected to meet those needs and the subsequent evaluation of that intervention.[217] By the 1980s there was general agreement that the metaparadigm

concepts shared by nursing models are: person, environment, health and nursing activities/ process.[215] Person refers to those receiving nursing care, including individuals, families, communities and other groups. Environment refers to the person's significant others and physical surroundings, as well the nursing setting. Health is the person's state of well being and nursing refers to the definition of nursing. [218]

### *6.2.1 The Nursing Process*

The nursing process has been described as neither a philosophy nor a theory, but as a process it exists on its own in vacuo; however it has to be used in the context of a conceptual framework i.e. a nursing model.[215] The nursing process can be described as a problem solving process, which helps the novice develop a style of thinking that leads to judgements in the form of diagnosis. Nursing models give shape to the components, begin to define nursing and direct the goals of nursing care. Nursing theorists in developing models of nursing are attempting to provide nurses with tools, which can be used to allow a systematic examination of events.[219]

The nursing process can be referred to in terms of assessment, planning, appropriate interventions and evaluation of care.[220] The nursing process enables the nurse to identify with patients' potential and actual problems. Planning of care encourages both the nurse and the patient to set goals which may be of a short-term, intermediate or long-term nature and specify behaviours which the patient should be able to achieve at the end of given points in time. Nursing interventions take the form of a series of activities with which nurses will be involved in order to help patients achieve goals. By emphasising evaluation, the nursing process encourages nurses to compare

the actual behaviours patients are capable of at particular points in their care with the goals previously set.

### *6.2.2 Surgical pain management in the context of nursing models*

It is of interest to discuss the management of acute surgical pain in the context of the overall literature discussing models and theories of nursing.

Many models of nursing based on theories are described in the literature. This author has chosen to describe three commonly used models in an Irish context and attempts to conceptualise acute pain within these models. The models chosen are based on self-care deficit theory (Orem's model), a model of living (Roper, Logan and Tierney's model) and adaptation theory (Roy's model). McKenna describes these nursing theories in the context of their metaparadigm components, person, nursing, health and environment. The following table is a replication of McKenna's summary of these three nursing theories and their metaparadigm components.

TABLE 6 MC KENNA'S SUMMARY OF THREE NURSING THEORIES AND THEIR METAPARADIGM COMPONENTS [221]

| | PERSON | NURSING | HEALTH | ENVIRONMENT |
|---|---|---|---|---|
| Roper, Logan and Tierney 1980 | Unfragmented whole who carries out or is assisted in carrying out activities which contribute to the process of living | A profession whose focus is to help the patient prevent, solve, alleviate, or cope with problems associated with the activities of living | The optimum level of independence in each activity of living which enables the individual to function at his or her maximum capacity | Circumstances which may impinge upon people as they travel along the life-span and cause movement to dependence or independence |
| Orem 1995 | Functional integrated whole with a motivation to achieve self-care | A human service related to the patient's need and ability to undertake self-care and to help him or her sustain health, recover from disease and injury or cope with their effects. | A state of wholeness or integrity of the individual, his or her parts and modes of functioning | A subcomponent of the person and with the person forms an integrated system related to self care. |
| Roy 1970 | A bio-psycho-social being who presents as an integrated whole | A socially valued service whose gaol is to promote a positive adaptation to the stimuli and stresses encountered by the patient | The adaptation of the person to stimuli on a continuous line between wellness and illness | Both internal and external; from the environment, the person is subject to stresses |

### *6.2.2.1 Orem's self-care model*

Orem's development of the model began between 1949 and 1957 by looking for the uniqueness of nursing.[222] The model was formalised between 1960 and 1980 with much input from students, scholars and colleagues. The self-care deficit theory proposes that individuals may experience self-care limitations related to their health state and may benefit from nursing provision of this care or augmentation of their own self-care.[223]

Orem[224] describes self-care as the personal care that individuals require each day to regulate their own functioning and development. Requirements of persons for this day-to-day regulatory care will be affected by, among other factors, age, developmental stage, health state, environmental conditions and effects of medical care. Dependent care is the continuing health-related personal regulatory and developmental care provided by responsible adults for infants and children or persons with disabling conditions. Self care is a human regulatory function that individuals must, with deliberation, perform for themselves or have performed for them (dependent-care) to supply and maintain a supply of materials and conditions to maintain life; to keep physical and psychic functioning and development of norms compatible with conditions essential for life.[225]

Orem's basic philosophy is that people either by their own efforts or by the efforts of significant others such as friends or family strive to achieve self-care. If self-care is not achievable, a self-care deficit exists, which is defined as a patient problem requiring a nursing intervention. This model's basic philosophy of nursing is therefore to help the patient and family achieve self-care. Orem's model may analyse the nursing care for goals using the above framework. This model of nursing therefore acknowledges that patients can have a wide range of dependency and emphasises the role of the nurse as both a provider of care and an educator about health. The aim of the nurse is to help patients to move along this continuum of self-care need until they can achieve the maximum possible self care with the nursing role ideally limited to support and advice.[226]

Orem describes three types of self care; universal, developmental and health deviation.[227] Universal self-care requisites are common to all human beings during all stages of the lifecycle, adjusted to age, developmental state and environmental and other factors. They are associated with life processes, with the maintenance of the integrity of human structure and functioning and with general well being. Developmental self-care requisites are associated with human developmental processes and with conditions and events occurring during various stages of the life cycle (e.g. pregnancy) and events that can adversely affect development. Health-deviation self-care requisites are associated with genetic and constitutional defects and human structural and functional deviations and with their effects and with medical diagnostic and treatment measures.

Universal self-care requisites address physiological needs and functioning, interaction and a sense of "normality". They include maintenance of a sufficient intake of air, water and food, elimination, activity, rest, solitude, social interaction, prevention of hazard and promotion of human functioning. The requisites related to activity and rest and solitude and social interaction are concerned with balance establishment and maintenance.[228] Developmental self-care requisites relate to factors, which affect development throughout the life cycle. They promote conditions, which support growth and development and which prevent or modify conditions that adversely affect the process. Health deviation self-care requisites address the increased demands on an individual experiencing disease or illness. These are structural, functional, or genetic defects that require intervention and treatment. They influence the individual's ability to self-care.[227]

*Surgical pain and Orem's self care model*

Surgical pain will affect the patient's ability to self-care. The type of surgery and how this impairs the condition of living will condition the therapeutic self-care demand. The person post surgery may be confined to limited movement or short spells out of bed in the first few days post surgery. The components of the therapeutic self-care demand could be considered as universal self-care requisites and health-deviation requisites.

Universal self-care requisites will be affected and deficits may occur if pain is present in sufficient levels post surgery. Maintenance of air may be affected if high levels of pain are present which may interfere with the ability to deep breathe and cough.[46] Actions to improve this situation may include administration of analgesia, non-pharmacological methods of pain management such as heat/ cold. Maintenance of a sufficient intake of water and food may be affected if nausea is present[45] or gut motility is reduced[18], due to pain. Actions to decrease these problems may include administration of anti-emetics or pain reducing measures and maintenance of intravenous hydration. Providing care associated with eliminative processes and excrements will be affected if there is inability to mobilise or dehydration due to pain. Actions to manage this situation may include recording bowel patterns, intake and output records and ensuring appropriate assistance with mobilising to toilet. Pain, if present in sufficient levels, will interfere with the balance between activity and rest, which in turn will cause sleep disturbances. These may all contribute to the cycle of pain; anxiety, fear, helplessness and sleep deprivation.[146] Actions to interrupt the cycle of pain include adequate pain reducing measures and anxiety reducing measures. Maintaining the balance between solitude and social interaction may

include distraction therapies for the patient such as provision of radio, tapes etc. depending on patients' preferences.

Preventing of hazards if pain is present may relate to prevention of side effects of high pain scores such as infection due to inability to deep breathe[47] or deep venous thrombosis due to inability to mobilise[18] or maintenance of equipment such as infusion pumps for analgesics. Being normal is also one of the universal health-care requisites. In relation to pain this may include treating the patient post surgery as a whole person and being aware of them as an individual with unique needs. These needs may relate to the individual's attitudes and past experiences of pain. Systems of communication may need to be developed such as the use of pain assessment tools in order that the patient can communicate their pain adequately. The nurse will need to be able to recognise evidence of discomfort and pain (non-verbal cues) and take appropriate and timely action. Health deviation requisites in the case of the patient in pain post surgery will create self-care deficits related to pain management. This may require the nurse to communicate with the medical team to report inadequate management of pain.

Surgical pain may thus be considered using Orem's self-care deficit model. The nurse will need knowledge and skills in acute pain management as well as interpersonal and communication skills in order to be able to meet the patient's therapeutic self-care demands.

### *6.2.2.2 The Roy adaptation model*

Roy considers health to be a function of adaptation to stresssors, which may be physiological, psychological or social in origin. Successful adaptation may be equated with health and therefore the nurse's role becomes one of assisting the patient to adapt to the stressors to which he or she is exposed. The model is behaviourist in nature since at its core lies the question of how the patient behaves in response to the various stressors of life. These stressors are known as stimuli in the Roy model and nursing care is seen wherever possible as being directed at the stimuli, i.e. the causes of the patient's problems.[226]

Roy sees man as having four modes of adaptation: basic physiological needs, self-concept, role function and interdependence. The model is described as flexible enough to be used in both episodic and distributive settings. However it is reported as working most effectively in the episodic setting where patients' conditions did not require frequent immediate decisions and most effective in the distributive setting with whom prolonged contact was possible. [229]

Roy[230] states that the ongoing interaction of people with their world and others is important to nursing practice. People thus never act in isolation but are influenced by the environment and in turn affect the environment. Roy considers three classes of stimuli, which form the environment; focal stimuli, contextual stimuli and residual stimuli. The focal stimulus is the internal or external stimulus most immediately in the awareness of the human system that is the object or event most present in consciousness. Contextual stimuli are all other stimuli present in the situation that contribute to the effect of the focal stimulus. These stimuli are all the environmental

factors that present to the human system from within or without but which are not the centre of attention or energy. These factors will influence how the human system can deal with the focal stimulus. Residual stimuli are environmental factors within or without human systems, the effects of which are unclear in the current situation. Roy states that the focal, contextual and residual stimuli change rapidly. The person and environment interaction is constantly changing and the significance of any one stimulus is changing.[230]

Roy views the nursing process in terms of "man beings as adaptive systems". Six steps have been identified as part of the nursing process; assessment of behaviour, assessment of stimuli, nursing diagnosis, goal setting, intervention and evaluation. Pain after surgery can be discussed within the context of these six steps.[230]

***Surgical pain and the Roy Adaptation Model***

The first step of the Roy's nursing process is the assessment of patient behaviour, which can be considered as the patient's actions or reactions to a specified circumstance, which may be observable or non-observable. Surgical pain could be considered the behaviour. Observation in this context of acute pain will be multi-faceted. Firstly this may involve visually looking for signs of pain. These may be signs such as guarding movements, shallow breathing, wincing.[67] Secondly this may involve looking for physiological signs of pain. Examples include inability to deep breathe, tachycardia, increased respirations, low blood pressure.[44] Both these types of assessment are useful but limited due to their relationship not just with pain but with other physiological causes. Thirdly, asking the patient about their pain will aid assessment of the observed behaviour. This may not always be possible given

ventilated or confused patients but it remains the main approach to pain assessment. It allows for an individualised approach to pain recognising the subjective nature of pain.[64] Assessment of pain is discussed in much detail in chapter 3 of this thesis. The literature is generally conclusive that assessment of acute pain relies on the patient's description of their pain intensity. This can be enhanced to a more objective state by the use of pain assessment tools such as pain scales. The accurate and timely documentation of the patient's pain allows for assessment of the observed pain to be put in context of the preceding day/ night. This allows the nurse to judge the progress of the person's pain over their postoperative recovery period.

The next step using the Roy Adaptation Model is the assessment of stimuli. The focal stimuli may be the surgery. The cause of pain may be the surgical incision site; however other factors may contribute to this pain such as poorly cited intravenous lines, uncomfortable positioning of drains or inadequate analgesia. The contextual stimulus may be the person's consideration of the cause of their pain. The pain may be tolerated better if the person knows that it is temporary or that it is expected as opposed to pain whose cause is unknown. The residual stimulus may relate to the patient as an individual. The patient may have worries or concerns, which might heighten their perception of pain. It is generally accepted in the literature the perceived difficulties separating the emotional and the physiological causes of pain.[29] Patient's pain may be influenced by their beliefs and expectations of the pain, which may be directly related to their knowledge of their pain and pain relief following their surgery.

The next step relates to the nursing diagnosis, which Roy[231] describes as a judgement process resulting in statements conveying the adaptation status of the human adaptive system. The judgements will provide specific indications for nursing interventions. This may involve adequate assessment of pain and adequacy of pain-relieving measures (verbal, non-verbal and physiological signs), assessment of the patient's ability to deep breathe and mobilise as well as assessment of the patient's knowledge and ability to cope.

Goal setting for acute pain management may involve a goal such as complete pain relief or pain relief in order that the patient can mobilise, can deep breathe and can sleep. The goal may also be that the patient is knowledgeable with regard to their pain and pain management. The intervention is described as the selection of nursing approaches to promote adaptation by changing stimuli or strengthening adaptive processes.[232] For the patient with surgical pain this may involve giving information, good assessment techniques and appropriate pain relieving measures. The last step of the Roy Adaptation Model is evaluation, which involves judging the effectiveness of the nursing intervention in relation to the behaviour of the human system. In the case of surgical pain the nurse can assess were the goals achieved. This may involve reviewing assessment of pain, pain management techniques and how the patient has coped with their pain.

In order to manage the patient's pain with reference to the Roy Adaptation Model the nurse must have the knowledge and skills necessary to assess, intervene and evaluate the intervention in relation to surgical pain.

*6.2.2.3 Roper, Logan and Tierney's model*

Roper, Logan and Tierney's model attempts to encapsulate the complexities of "living". There are five main components in the model; activities of daily living (Als), lifespan, dependence/ independence continuum, factors influencing Als and individuality in living.

This model is derived from the notion that humans carry out a series of everyday activities, which are essential to normal functioning. The model describes 12 such activities of living. Each activity is closely related to the other and each activity has many dimensions.[215] The following are the activities of daily living:

1. Maintaining a safe environment;
2. Communicating with others, both verbally and non-verbally;
3. Breathing;
4. Eating and drinking;
5. Elimination of body wastes;
6. Personal cleansing and dressing;
7. Controlling body temperature;
8. Mobilising;
9. Working and playing;
10. Expressing sexuality (appearance, relationships etc.);
11. Sleeping;
12. Dying.

The model considers that humans exist on an independence-dependence continuum and this is reflected in each of these 12 activities of living (ALs). Thus, a person can be positioned somewhere between the two extremes for each of these 12 ALs with age and illness playing a major role in determining their exact location.[226]

The dependence/ independence continuum component of the model is closely related to lifespan and to the Als. Each person can be said to have a dependence/ independence continuum for each Al. Factors influencing the Als are biological (related to the human body's anatomical and physiological function), psychological,

sociocultural (spiritual, religious, ethical aspects of living), environmental and politicoeconomic (legal, political, economic influences). Individuality in living serves to emphasise the point that living is experienced on an individual level and although each individual carries out all of the Als, each does so differently.[215]

The function of nursing is seen as trying to promote maximum independence for each AL and meet the patient's needs that arise due to increasing dependence. It is important to maintain the patient's normal routine as far as possible. Where this is identified as having contributed to the patient's illness, the nurse is seen as being responsible for trying to change the patient's attitudes to be more compatible with health. The nursing role can vary from giving information to the patient through to actually carrying out an AL if the patient is unable to do it for him or herself.[226]

***Acute surgical pain and the Roper, Logan, Tierney model***

Acute pain post surgery can be considered in the context of Roper, Logan and Tierney's activities of daily living model. Pain as part of a care plan could be isolated separately however given that many of the Als are closely related to each other pain management post surgery may well be considered under many of the Roper', Logan and Tierney's Als. The plan of care involves assessment, preparing a nursing plan (setting goals), implementing and evaluating the plan of care.

Maintaining a safe environment for the patient with pain post surgery involves assessing the patient's risks of their safe environment being compromised, setting goals and evaluation of care following implementation. Firstly the nurse may set a goal to ensure that the pain is managed so that patient is not exposed to postoperative

complications associated with postoperative pain. Various physiological responses, which are associated with acute pain are discussed in chapter 2 of this thesis. These include a stress response[44], increased nausea[45], respiratory infections[47] and reduced return of normal gut activity[18]. Included in a safe environment must be considered maintenance of analgesia given for pain. This includes appropriate monitoring of analgesia devices and effects and side effects of analgesia administered.

Communicating with others, both verbally and non-verbally is another of the Als. In the context of pain management this may incorporate the ability of the patient to communicate their pain. The goal may be to find a method for the patient to communicate their pain and the effectiveness of analgesia given. Nurses thus, must be alert for non-verbal signs of pain. Verbal assessment may include the use of pain assessment tools.

Breathing is important when considering acute pain management. High levels of pain are associated with diminishing the ability to deep breathe or cough thus both vital and functional capacity are substantially decreased. These may promote respiratory complications. The goal may be to ensure pain is managed sufficiently well so that the patient can deep breathe and cough.

Eating and drinking may both be affected by pain. The goal may be to ensure the return normal eating and drinking patterns as soon as possible. Both nausea and reduced gut motility are associated with high pain scores. In relation to personal cleansing and dressing the goal may be to encourage the patient to self-care as soon as

possible. Good pain management will ensure early mobilisation, which in turn may help prevent complications, post surgery.

The goal for work and play may be to return to normal activities as soon as possible. Play and distraction, whether that is watching television or playing video games etc. may help the person to normal recovery. The importance of sleep is emphasised in the pain cycle. The cycle consists of anxiety, fear, helplessness and sleep deprivation, the idea being that each of these have the potential to exacerbate the person's perception of their pain. Thus ensuring a restful night's sleep for the patient will affect their pain experience.

The use of the Roper, Logan and Tierney model for acute pain will require the nurse to be knowledgeable and skilled in acute pain management.

### 6.3 NURSES' CLINICAL DECISION MAKING

Clinical decision making has been recognised by nurses internationally as an important part of providing nursing care.[233] Clinical decision making in nursing is undeniably a complex process, which has been the basis of much discussion in the nursing literature. Clinical decision making enhances nurses' abilities to assess patients, to identify problems and to plan individualised care. Today, nurses are held responsible and accountable for the clinical decisions they make within their practice and they require support and opportunity to develop these difficult cognitive skills.[234]

Jenks (1993) describes clinical decision making by nurses as a highly complex process shown to entail both cognitive, intuitive processes being influenced by the

experience of the nurse. She states that the successful application of theory to practice requires that educators transmit nursing theory and develop decision-making skills in students.[235] Following a qualitative study of 23 nurses she proposes that one of the major themes that emerged in relation to clinical decision making was the concept of knowing. This is described as knowing patients, fellow staff and in some incidences physicians. Jenks described that knowing the patient was the biggest help in deciding what patients' needs are. Knowing the patient in relation to pain may involve discussing pain assessment (patient's expression of pain), knowing the patient's knowledge of pain and pain management and knowing the patient's normal physiological and physical reaction so that they can be used as a base to measure progress post surgery. This will also mean knowing the individual patient and their particular worries or concerns about pain or any mechanisms that they may have to cope with pain.

Secondly, "knowing peer staff" is described by Jenks (1993), outlining that clinical decisions can be influenced by relationships between and among staff. Peacekeeping behaviours and doing as peers do influence decision-making. In relation to pain this may necessitate the need for all staff to be working from a similar philosophy in relation to assessment, goal setting and evaluation of care in relation to acute pain. Thirdly Jenks describes relationships with physicians.[235] Such relationships in relation to acute pain will require the ability to work within a multi-disciplinary team and good communication skills.

O'Neill (1999) describes clinical reasoning skills as the cornerstone of successful nursing practice.[236] The study is an evaluation of 36 students' clinical decision making skills who had undergone a clinical decision making in nursing course.

Review was via analysis of the student's papers. One issue that emerged was the influence of contextual factors in clinical decision making. The students described a broad range of contextual factors including "time", "doctor" and "documentation". For example, inadequate documentation tools did not aid decision-making. Tschikota following a descriptive study of the clinical decision making skills of 19 nursing students describes how students with an internal locus of control used significantly higher proportion of complex decision-making process than those with external control.[237]

Orme highlights that clinical decision making must take place within the context of a philosophy of care. Without such a philosophy decisions will be arbitrary, uninformed and probably unsafe.[238] Orme also highlights that a number of factors are essential for effective decision making at expert level. She maintains that there must be a sound and developed knowledge base, informed by evaluated research. Secondly, the environment within which expert practitioners' work can enhance or detract from the decision-making process. This implies a managerial and a professional commitment to developing the decision-making role and creating an environment, which facilitates risk-taking within clear safety and professional boundaries. Peer support and approval is vital to the creation of such a supportive environment.

Benner[239] asserts that perceptual awareness is central to good nursing judgement. Nurses, according to Benner, pass through five levels of skill performance in clinical practice. These are characterised as; novice practice, advanced beginner practice, competent practice, proficient practice and expert practice. Experience is seen as the

critical element in the progression of a nurse through the levels of practice. Expert nurses often describe their perceptual abilities as "gut" feeling.

Novice practitioners are inexperienced and are characterised as being reliant on rule-governed behaviour to guide action.[240] The advanced-beginner practitioner needs help setting priorities since she/he operates on general guidelines and is only beginning to perceive recurrent meaningful patterns. The competent practitioner can rely on long range goals and plans to determine which aspects of a situation are important and which can be ignored, a feeling of mastery is being reached. The competent practitioner lacks the speed and flexibility of the nurse who has reached the proficient level. The proficient practitioner has holistic understanding of the situation and decision making is less laboured. The expert practitioner is characterised by an intuitive grasp of each situation and no longer relies on analytic principles. Benner's theory reflects the progression of nursing practice and recognises the concept, not unique to nursing that there are different levels of practice-based on experience and education.

Rolfe[241] suggests that there is a sixth level beyond expertise, which is characterised by mindful practice and informal theory building. At this level the practitioner constructs informal theory out of practice, applies that theory back into practice and reflexively modifies the theory as a result of the changed clinical situation. However although Rolfe outlines a number of discrete elements to reflexive action he concedes that reflexive practice is difficult to pin down due to its nature. Firstly its components blend together in one smooth action and secondly it takes place in live, real-time practice situations.

*Clinical decision making and acute surgical pain management*

The issue of nurses' clinical decision making and the foundations upon which such decision making is made are important when considering acute surgical pain management by nurses. Pain management is intimately linked to decision making. Common clinical decisions relating to pain management include assessment of pain intensity, when to give medication, choice and dose of analgesics and non-drug choices. Both verbal and non-verbal cues can be seen as essential regarding pain assessment. Nursing knowledge is an important precursor for decision making.[242] It is suggested in the literature that the problem with under-management of acute pain lies not so much in finding new strategies to manage pain but in having health care professionals utilise available scientific knowledge in their daily practice.[15] This ultimately leads back to the clinical decision making of the professional involved in pain management.

Clinical decision making with regard to acute surgical pain management requires the nurse to have the ability to assess pain accurately in order to manage that pain. Inherent in this involves the ability to provide information to the patient, to be knowledgeable of medication, their effect and side effects. The nurse, in order to make decisions, must have knowledge of non-pharmacological approaches to pain management such as anxiety reduction or the use of heat/ cold therapy.

# Chapter 7

## Methodology

## 7.1 AIMS AND OBJECTICES

*Aim of Study*

The aim of the study was to evaluate the effectiveness of the introduction of a number of nurse-led interventions to improve pain management post surgery.

*Objectives*

1. To introduce a nurse-led intervention to one hospital, the intervention hospital.

2. To compare pain scores pre and post the intervention in the intervention hospital with a comparable control hospital.

3. To compare patient knowledge and attitudes of acute pain management using a structured questionnaire pre and post intervention in the intervention hospital with a comparable control hospital.

## 7.2 STUDY DESIGN AND METHODS

### *7.2.1 Rationale for study design*

This section outlines the rationale for the study choice discussing the benefits and limitations of study design options to answer the study's aim and objectives. The author of this thesis hypothesised that the deficiencies in nurse education and the lack of knowledge of world-wide developments in acute pain management lead to poor pain management post surgery. The study aim was to evaluate the effects of the introduction of a number of measures to improve acute pain management by nurses. The study objectives were (a) to introduce a nurse-led intervention to one hospital, the intervention hospital, (b) to compare pain scores pre and post the intervention in the intervention hospital with a comparable control hospital and (c) to compare patient knowledge and attitudes of acute pain management using a structured questionnaire pre and post intervention in the intervention hospital with a comparable control hospital.

***Audit versus research***

The use of audit could have been an approach to evaluate the introduction of an intervention to improve pain management. Audit has been conceptualised as a repeating cyclical process where the monitoring of practice is interspersed with attempts to improve practice. Research on the other hand has been described as having the aim of establishing what is best practice.[243] The essential nature of research lies in its intent to create new knowledge. It does this through a process of systematic enquiry governed by scientific principle.[244] Audit and research are activities, which are described as having some characteristics in common, and others, which are rather different.[245 246] Many of the data collection methods used in research for example, questionnaires, interviews and record review are also used in audit.[243] A distinction made in

the literature is that research is concerned with discovering the right thing to do and audit is concerned with ensuring that it is done right.[247] Audit thus is about doing the right thing and doing it better whereas research is asking what is the right thing to do.[248]

Audit has been defined as cyclic activity incorporating both systematic evaluation of the quality of clinical practice and action taken in response to the results of this evaluation.[249] Following a review of 37 studies of audit and feedback and its effects on professional practice and health care outcomes, the conclusion was made that audit and feedback can sometimes be effective in improving practice of healthcare professionals. However the authors state that effects appear to be small to moderate and that those attempting to enhance professional behaviour should not rely solely on this approach.[250] Authors reviewing audit and feedback versus alternative strategies and their effects on professional practice and healthcare outcomes do not recommend a complementary intervention to enhance the effectiveness of audit and feedback.[251]

Bull[252] states that research aims to extend scientific knowledge. Clinical research examines the difference a particular clinical intervention will make and in which patients. It tests the links between the processes and outcomes of care and generates knowledge that is transferable. Audit however aims to extend practitioners' knowledge about their own practice. Audit examines whether the right intervention is being made in the appropriate patients with the expected success. Thus audit tests processes and outcome independently in the knowledge that the link has already been established.[253] This author therefore, due to the untested nature of the study aims and objectives, chose to use a research approach to the study design.

**Research methodologies**

There are two main approaches that underpin research methodologies, the qualitative and quantitative paradigms. Both qualitative and quantitative researchers are concerned with the construction of solid theory as an outcome, however their approach is different. The qualitative researcher's emphasis is on the construction of the theory (an inductive approach) while the quantitative researcher's emphasis is on the testing of theory (a deductive approach).[254] Generally quantitative methods are useful if one knows something about a subject whereas qualitative methods are superior if one wishes to explore a topic more fully.[255] Qualitative methods seek to examine phenomena in context, generating theory and concepts and encourages study designs where the researcher and subject are part of a two way process in which understanding develops in the development of theory.[256] Quantitative methodologies, in contrast, test theory deductively from existing knowledge, through developing hypothesised relationships and proposed outcomes for study.[257]

The qualitative approach is primarily concerned with developing a description of an observed phenomenon to generate solid theory as an outcome or the product of their research. Qualitative researchers begin data collection by examining observations and reports of the phenomena as they occur in everyday life. Qualitative research is usually conducted to explore problems about which relatively little is known. Qualitative researchers often cannot find adequate information to begin formulating a theory about the phenomena. The goal of qualitative research is to develop theory using rich description, data synthesis and abstraction. Qualitative enquiry is a process of documenting, describing, identifying patterns and concepts, identifying the relationship between concepts and creating theoretical explanations that explain reality.[254]

Quantitative research looks for relationships between variables so that causality may be explained and accurate prediction becomes possible.[254] Quantitative approaches allow for the measurement of larger amounts of data within pre-determined criteria thus facilitating comparison and statistical analysis.[258] The quantitative researcher begins with a hypothesis, which is then tested and either supported or otherwise through analysis of the data collected. Quantitative research is usually used to investigate concrete phenomenon that have been previously examined to the point that they can be measured.[254]

The nature of the research will dictate the approach taken.[259] The research approach adopted will depend on several factors including the nature of the phenomena to be investigated, the aim of the research and the state of existing knowledge.[260] Morse and Field[254] note that in selecting a research approach to investigate a particular phenomenon a number of issues need to be considered. These are the nature of the phenomena to be studied, the maturity of the concept, the constraints of the setting and the researcher's ability and agenda.

There is little doubt of the existence of persistent postoperative pain in spite of the many advances in acute pain management. The literature outlines many reasons for this phenomenon including the role of the nurse. In relation to the role of the nurse, studies highlight the poor knowledge, inappropriate attitudes, inadequate assessment of pain by nurses and poor use of pain management techniques as a cause of unresolved acute pain post surgery. [13 119 120] The author of this thesis therefore wished to evaluate the effects of the introduction of a number of measures to improve acute pain management by nurses. The evidence and theory is already well documented in relation to pain management therefore the author chose a quantitative approach.

**Quantitative research**

Quantitative research includes descriptive, correlational, quasi-experimental and experimental research. Descriptive research aims to describe characteristics, correlational research aims to investigate systematically and explain the relationship between variables while the aim of experimental research is to test cause and effect relationships. It is considered to be the most powerful quantitative method because of the rigorous control of variables.[260] Closs and Cheater state that the best evidence concerning effectiveness comes from intervention research. Thus in order to evaluate the introduction of a nurse-led intervention the author chose an experimental approach.[245]

A number of approaches, which evaluate changes in pain scores following the implementation of an intervention, are published (outlined in appendix 2). These are "before, after" or "pre-test, post-test" study designs. Control hospitals were not used in any these studies. These studies are, in general, clinical audits of the effectiveness of acute pain services. Interventions in the studies varied from the introduction of pain assessment, to patient information, protocols, education strategies, new methods of analgesia delivery and to the introduction of a multidisciplinary team. There is one exception in the literature where Rose 1997[261] introduced patient strategies such as enhanced use of PCA and education for anesthetists incorporating both a control and an intervention hospital. The intervention was anaesthetic led with the primary objective of changing anesthetist's practice of pain management. Results showed successful changes in pain management practices but only modest improvements in patient outcomes. There was a small decline in mean pain scores with activity in the first six-hour interval following discharge from a postanaesthesia care unit

in the study hospital. The control hospital however showed similar declines in postoperative pain scores. The authors concluded that any changes in patient outcomes could not be attributed to the directed interventions.

The study design for this thesis was experimental in nature. In order to evaluate whether changes in pain scores were due to the intervention, the author of this thesis thus included a control hospital, which received no intervention. The design, as a parallel clinical trial compared patients' pain experiences within two hospitals, a control and an intervention hospital, over time (figure 8).

### *7.2.2 Study Design*

The study was conducted in three main phases as outlined in figure 8. The study design was a parallel clinical trail. Abramson [19] describes parallel clinical trials as experiments or quasi-experiments that test hypotheses concerning the effects of intervention techniques applied to individuals. A parallel trial can be described as a study in which two or more independent groups are studied prospectively and then compared. These groups are exposed to different interventions and the outcomes compared with each other. Parallel comparisons require information about the subjects before as well as after the intervention (i.e. they should be "pre-measure - post-measure" or "pre-test - post-test" studies). This not only permits a check on the comparability of the groups before the intervention, it also makes it possible to take proper account of possible confounders and modifiers in the analysis.

Lavori et al[262] describe such trials as "parallel trials" to emphasise their difference from other clinical trials in which patients are their own controls or controls are drawn from historical or

other data external to the work reported. Lavori et al state the importance of avoiding bias by balancing prognostic factors during treatment assignment.

In this study patients completed a questionnaire and recorded pain scores in two hospitals, a control hospital and an intervention hospital, pre introducing an intervention into the intervention hospital. The questionnaire and pain scores were recorded in both hospitals after the intervention.

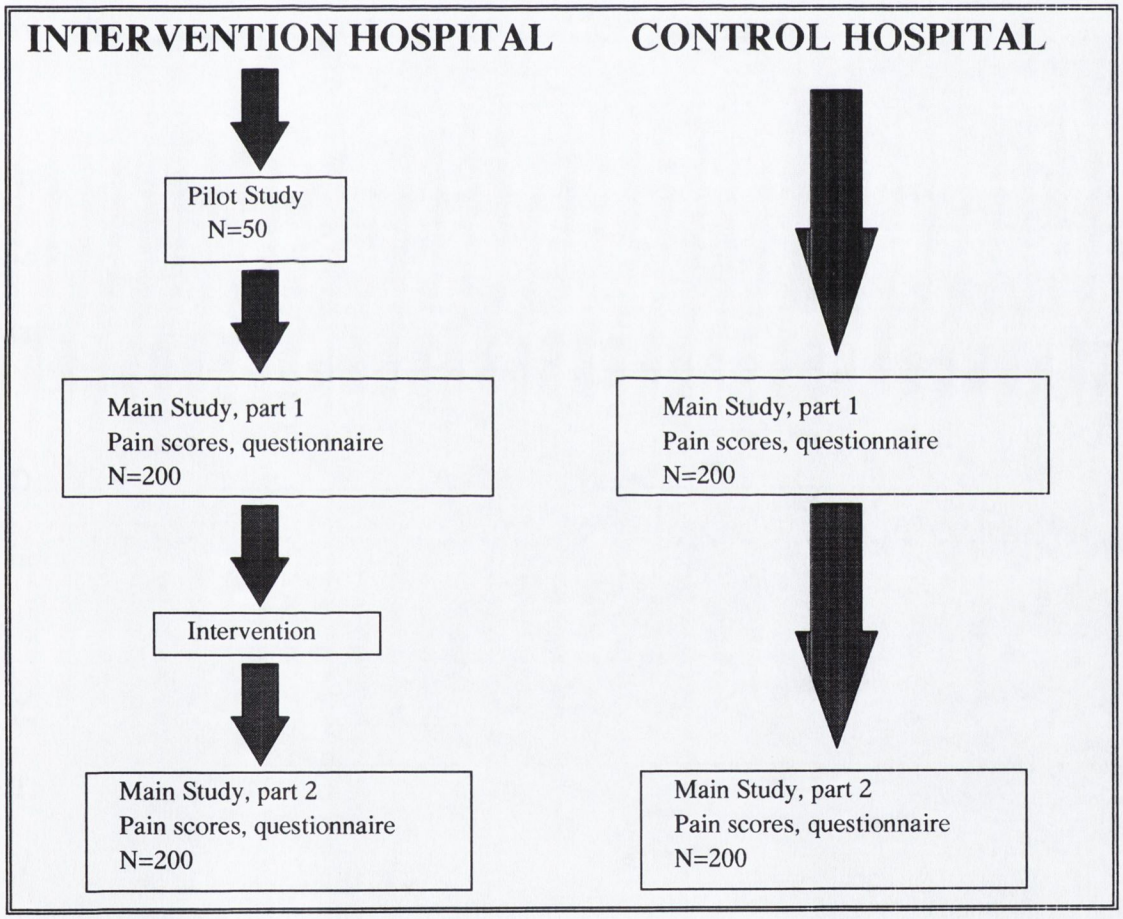


FIGURE 8 STUDY DESIGN

### *7.2.3 Comparability of the Intervention and the Control Hospital*

The two hospitals chosen to be involved in the study were both training hospitals in Dublin, Ireland. The hospitals were deemed to be comparable because of similar patient profile, similar hospital history and similar nurse training systems. Nurse training in Ireland and the history of both hospitals are described in chapter 1 of this thesis. At the time of the study the two hospitals were located in Dublin County Borough and had geographic proximity. The hospitals were located in District Electoral Divisions 157 and 162. Small area population statistics for the Census 1996 showed that both hospitals provided for a community with comparable socio-economic groups, age-groups and unemployment levels.[20]

Important prognostic factors in the study were age, gender and operation category. Differences between any of the above factors at any stage of the study could effect the credibility of any changes that the intervention may be deemed to have brought about.

Demographics deemed to be prognostic factors were compared pre and post intervention both between and within hospitals in Chapter 8.

### *7.2.4 Ethical approval*

The study proposal was sent to the Joint Research Ethics Committee of the Federated Dublin Voluntary Hospitals in order to obtain ethical approval. This committee is composed of lay and medical representatives of St. James's Hospital, the Federated Dublin Voluntary Hospitals, Dublin Dental Hospital and Trinity College. The committee reviews proposed projects and, if approved, writes to the researcher and informs the relevant hospital board.

The above committee following submission and presentation of the proposal approved this study proposal (appendix 3).

### *7.2.5 Permission to conduct the study*

Once ethical approval was obtained the Directors of Nursing in both hospitals and all relevant Consultants were contacted in writing (appendix 4).

Permission to conduct the study was obtained from both Directors of Nursing.
The majority of the consultants contacted gave permission for their patients to be included in the study (8 in the intervention hospital and 6 in the control hospital). Two general surgeons in the intervention hospital refused permission. Reasons for refusal were (a) that over-anxious patients would be made more anxious and (b) there were too many surveys going on in the hospital.

### *7.2.6 Patient Confidentiality*

Polit and Hungler describe confidentiality as the protection of participants in a study such that their individual identities will not be linked to the information they provide and will never be publicly divulged.[263]

Patient confidentiality was maintained in this study by including a detachable front sheet with the questionnaire. This front sheet contained the patient's name and ward details for the duration of the hospital stay. The front sheet was then detached and destroyed and each questionnaire given a coding number.

### *7.2.7 Consent*

Informed consent is an ethical principle that requires researchers to obtain the voluntary participation of subjects, after informing them of possible risks and benefits. Polit and Hungler [264] state that fully-informed consent involves the disclosure of the following pieces of information to subjects:- subject status - prospective subjects should be informed that any data they provide will be used in a scientific study, study purpose, type of data, nature of commitment, any sponsorship, subject selection, procedures involved, potential risks or costs, potential benefits, confidentiality pledge, voluntary consent, right to withdraw and contact information.

In this study oral consent was obtained from each patient the night before surgery. The study design was explained to the patient and a fact sheet was given (appendix 5) explaining the commitment expected from the patient by consenting to participate in the study.
Each patient was given the choice to participate in the study and was informed that, if at any stage during the study, they wished to drop out this was their right.

Patients were informed that all information obtained would be used for research purposes only. They were advised that confidentiality would be maintained at all times.

### *7.2.8 Pain Score Measurement*

The literature is conflicting in relation to accuracy and reliability of recall of pain[265 266 267 268 269 270 271 272] and is not conclusive that recall of pain is accurate even at 24/ 48 hours post surgery.

Thus in this study pain was rated three hourly, 8am to 8pm from day of surgery for two days post surgery. This provided an overall picture of pain in the first three twelve-hour day-time periods post surgery. Pain was not recorded at night. Regular recording of night-time pain would have involved waking patients in order to ensure that all patients had a comparable number of pain scores.

Three-hourly measures gave five pain measures per patient per day. Patients who were asleep were not woken up and this was marked appropriately on the pain score record sheet.

A 10cm Visual Analogue Scale (VAS) with no pain at one end and worst pain imaginable at the other end was used as the pain assessment tool. The VAS is discussed in detail in the literature review. It is considered to be the most sensitive method for measuring pain intensity as well as being a valid and reliable measure of pain with a length of 10 cm considered most suitable. [69 72 74 75 273]

The scale was constructed of wood, had a moveable arrow and contained a white strip, 10 cms in length. The strip had a line scale with no pain written at one end and worst pain imaginable written at the other end. When the patient slid the arrow to the mark on the line that they chose to represent their pain, the scale was flipped over and markings from 0 to 10 could be read off on the other side (pictures in appendix 6).

## 7.3 QUESTIONNAIRE DEVELOPMENT

Patients were asked to complete a questionnaire at three stages during their stay in hospital. The first stage was prior to surgery, the second, 24 hours post surgery and the third the day of discharge. The content of the questions in the questionnaire was developed from issues arising in the literature and from consultation with experts in the field (table 7). The questionnaire was 8 pages long. The ethics committee was concerned that the questionnaire length would be appropriate for ill patients and that it would not tax patients unduly. This length was deemed appropriate.

TABLE 7 QUESTIONNAIRE CONTENT

| STAGE | PAGE NUMBER | QUESTIONS ASKED |
|---|---|---|
| **Pre-operative** | 1 | *Demographics* -<br>• Age, Gender, Operation,<br>• Whether patients had previous surgery<br>• Whether patients had pain prior to surgery<br>• Length of stay post operation |
| **Pre-operative** | 2-3 | • Whether patients had been given information re pain<br>• Patient's expectations of pain<br>• Patient's expectations of pain relief |
| **Post-operative at 24 hours** | 3-4 | • Amount of pain that patients had<br>• Relief obtained from pain killers<br>• When patients asked for pain killers<br>• Whether pain interrupted sleep pattern |
| **Day of Discharge** | 5-8 | • Information recall re pain<br>• The adequacy of information given<br>• Decision making re pain killers<br>• Whether patients felt pain was believed<br>• Worries patients had re pain and pain relief<br>• Any difficulties describing pain<br>• Control over pain relief<br>• Whether it was possible to become addicted to pain killers in hospital<br>• Other sequelae experienced<br>• Patients' satisfaction with pain relief<br>• Patients' satisfaction with pain management<br>• Any other comments |

### *7.3.1 Reliability of questionnaire*

Reliability refers to the stability or consistency of information i.e. the extent to which similar information is supplied when a measurement is performed more than once. Variability between measurements may have its source in (1) change in the characteristics being measured (2) the measuring instrument (3) the person collecting the information.[274]

Measures were taken to reduce variability in this study and thus enhance reliability. The measuring instrument used was a structured questionnaire. This did not change for the main study i.e. the questions remained the same. The data collectors asked the questions directly from the questionnaire. There were two data collectors including the author. The data collectors were given two hours training. This involved explanation of the study, the questionnaire and the pain ratings. The data collectors were taught to use a standard explanation of the study when requesting consent. Identity badges were issued and letters of introduction were given which could be used if requested. The data collectors were taught how to ask the questions in exactly the same way and to record the answers in the spaces provided in the questionnaire in a similar manner.

### *7.3.2 Validity of questionnaire*

The validity of a measure refers to the adequacy with which the method of measurement does its job i.e. how well does it measure the characteristic that the investigator actually wants to measure.[275]

An expert team assessed face, content and consensual validity of the questionnaire. The terms face and content validity are technical descriptions of the judgement that a scale looks

reasonable. Face validity indicates whether, on the face of it, the instrument appears to be assessing the desired qualities. The criterion represents a subjectively based review of the instrument by one or more experts. Content validity is a closely-related concept, consisting of a judgement as to whether the instrument samples all the relevant or important content or domains. These two forms of validity consist of a judgement by experts whether the scale appears appropriate for the intended purpose.[276] When a number of experts agree that a measure is valid, this is consensual validity.[212]

The questionnaire was reviewed by a consultant anaesthetist and a pain nurse specialist. Both recommended changes (a) to the question wording and (b) to question content, these changes were duly made.

### *7.3.3 Pre-test of questionnaire*

The questionnaire was pre-tested with twenty patients and twenty nurses to check the following (as recommended by Streiner and Norman[277]): reading level, ambiguity, double-barrelled questions, jargon, value-laden words, positive or negative wording and length of items.

Further changes were made to the questionnaire. Appendix 7 contains the original questionnaire prior to any changes and appendix 8 the final questionnaire used following the changes.

### *7.3.4 Sample*

Gynaecological, orthopaedic, urological and general surgical patients were included in the study. Two hundred patients were interviewed in each hospital pre and post intervention. This involved interviewing a total of 800 patients.

Operations were classified as either major, intermediate or minor cases by a consultant anaesthetist. Following the pilot, it was decided to omit minor cases fror the main study. This for two reasons: firstly, their length of stay was short varying from 24 to 48 hours and, secondly, their levels of pain were relatively low, ranging from 0 – 2 on the Visual Analogue Scale. It was considered that it would be too difficult to assess changes for these levels of pain.

Operations were classified as either major or intermediate surgery for the main study. For example a TURP was considered as immediate surgery and a vaginal hysterectomy as major surgery (see appendix 9). Patients from five wards were involved in hospital A and six wards in hospital B. Patients were included if they were on the planned theatre list. Patients were approached the evening prior to surgery and consent was obtained. All patients on the planned theatre lists were included in the study unless the following criteria applied:

TABLE 8 EXCLUSION CRITERIA

| |
|---|
| 4. Patients admitted to the intensive care unit or high dependency unit. |
| 2. Patients with surgical complications. |
| 5. Patients who were confused. |
| 6. Patients unable to use a visual analogue scale. |
| 7. Patients who did not give consent. |

The study was conducted in three phases. The following sections, 7.4 and 7.5 describe these phases.

## 7.4 PHASE 1 OF THE STUDY

This phase comprised of two parts and will be described in the following two sections:

### *7.4.1 Part 1 – Pilot Study*

### *7.4.2 Part 2 - Interviews with patients in hospital A and hospital B*

### *7.4.1 Phase 1: Part 1 Pilot Study*

A pilot study was conducted in hospital A prior to the main study. Fifty patients, major, intermediate and minor cases were selected from theatre lists over a one-month period. Each patient was interviewed at three stages during their hospital stay: firstly, prior to surgery, secondly, at 24 hours post surgery and thirdly, on day of discharge using the structured questionnaire. Each patient's pain was assessed for 48 hours post surgery on a Visual Analogue Scale, from 8 a.m. to 8 p.m. at three-hourly intervals.

Following the pilot study the following amendments were made to the study design:-

1. Minor cases were omitted from the main study as described in section 6.3.4
2. Some changes were made to the layout of the questionnaire.

### *7.4.2 Phase 1: Part 2 Interviews with patients in hospital A and hospital B*

Each patient was interviewed at three stages during their hospital stay: firstly, prior to surgery, secondly, at 24 hours post surgery and thirdly, on day of discharge using the structured questionnaire. Each patient's pain was assessed for 48 hours post surgery on a Visual Analogue Scale, from 8 a.m. to 8 p.m. at three-hourly intervals and marked on a

specially designed record sheet (appendix 10). This phase was conducted over a eight-month period.

## 7.5 PHASE 2 and PHASE 3

Phase 2 and phase 3 are described in this section. Phase 2 is described first.

Phase 2 involved the implementation of a pain management programme (the intervention) by the author in Hospital A. This phase was conducted over a ten month period. This programme was not randomly assigned as to which hospital would receive the programme. For convenience Hospital A was chosen. Table 9 outlines the programme.

TABLE 9 PAIN MANAGEMENT PROGRAMME

| |
|---|
| 1. Introduction of pain charts (appendix 11). |
| 2. Introduction of pain scores on vital signs sheet (appendix 12). |
| 3. Provision of reading material on the ward area (appendix 13). |
| 4. Pain education programme. |
| 5. Pain policy for the hospital. |
| 6. National pain conference. |
| 7. Poster display |

The following sections (7.51 –7.56) discuss each part of the programme.

### *7.5.1 Pain scores and Pain Chart*

A pain score was added to the vital signs chart for all patients. Nurses were encouraged to rate pain at the same time as checking patients' temperature, pulse and blood pressure. This

pain rating was between 0 and 10, 0 being no pain and 10 worst pain imaginable. The aim of regular documentation of pain scores was to raise nurses' awareness of the extent of the patient's pain, to provide auditable documentation of pain and to act as a guide towards the patient's pain management plan. To supplement this for patients with pain, which was chronic or difficult to manage, a pain chart was devised. This pain chart rates the quality, site and actions taken in relation to the pain.

### *7.5.2 Reading Material*

A broad range of reading material was provided in a specially-marked folder on all surgical wards. Table 10 outlines the material provided. This folder was available for all nurses to read and was updated at regular intervals.

TABLE 10 READING MATERIAL PROVIDED ON ALL SURGICAL WARDS

| ARTICLE | SOURCE |
|---|---|
| • Acute postoperative pain management: A comprehensive review and update | Jurf B. and Nirschl A. *Critical Care Nurs Q* 1993;16;1:8-25. |
| • A summary of pain physiology | Author (Appendix 13) |
| • A summary of pain assessment | Author (Appendix 13) |
| • A quick guide to pain management | Author (Appendix 13) |

### *7.5.3 Pain Education Programme*

The educational programme involved running short pain courses and providing regular in-service talks on pain management. The short pain courses involved attending lectures for two afternoons (total 5 hours). The lectures are outlined in table 11. Hofer recommends that all

nurses involved in pain therapy are instructed on a regular basis with emphasis on pathophysiology of pain, evaluation of pain, pharmacology of the most important analgesic drugs, pharmacological versus non-pharmacological therapies and management of technical devices used in the hospital for pain therapy.[278]

TABLE 11 PAIN EDUCATION LECTURES

| LECTURE | SPEAKER |
|---|---|
| Pain physiology | Author |
| Pain assessment | Author |
| Patient Controlled Analgesia | Theatre sister |
| Pharmacological aspects | Pharmacist |
| Acute pain management | Anaesthetist |
| Entonox | Nurse Tutor |
| Philosophy of palliative care | Palliative care sister |
| Morphine titration | Napp education officer |
| Rheumatoid arthritis | Ward sister |
| Analgesia used in ICU/ HDU | Pharmacist |
| Epidural/ spinal analgesia | Anaesthetist |

### *7.5.4 Pain Policy*

The hospital had no pain policy in place. The author felt that in order to influence pain management a statement of the hospital's aims in relation to pain management should be developed and made available in all units of the hospital. The author developed the pain policy from the literature and in consultation with experts in the hospital. The policy was then submitted for approval to the hospital's nursing policy committee and subsequently introduced to the hospital. The aim of the policy was to provide a framework within which pain could be managed more effectively and efficiently. A copy of the policy was placed in each clinical area's policy manual. A copy of policy is in appendix 14.

### *7.5.5 National Pain Conference*

The author organised the first National Pain Conference for nurses in the Republic of Ireland. The aim was to profile experts on pain within the hospital, to provide a national forum for pain management and to provide information on pain management. Contents of the day are in appendix 15. Twenty five nurses from the hospital attended, representing the surgical wards.

### *7.5.6 Poster Display*

A poster display of the following topics (table 12) was held at the hospital's study days. These study days are attended by all ward sisters and 50% of staff nurses within the hospital annually. The aim of the display was to raise awareness of the importance of pain management, to provide information on pain and to highlight the personnel within the hospital who have knowledge of pain management.

TABLE 12 POSTER DISPLAY

| POSTER | PREPARED BY |
|---|---|
| Pain physiology | Author |
| Pain assessment | Author |
| Pain in the accident and emergency department | Course facilitator |
| Pain for the Rheumatology patient | Ward sister |
| Results of studies on pain | Author |
| Complimentary therapies | Nurse Tutor |

### *7.5.7 Phase 3*

This phase was conducted 3 months after phase 2. This phase was identical to phase 1. It involved interviewing 400 patients, 200 in hospital A and 200 in hospital B. Patients in both hospital A and hospital B were interviewed at three stages during their hospital stay: firstly, prior to surgery, secondly, at 24 hours post surgery and, thirdly, on day of discharge using the

structured questionnaire. Each patient's pain was assessed for 48 hours post surgery on a Visual Analogue Scale, from 8 a.m. to 8 p.m. at three-hourly intervals and marked on a specially designed record sheet. This phase was conducted over an eight-month period.

## 7.6 DATA MANAGEMENT

The pain scores and the answers to the questionnaire were entered onto a spreadsheet and analysed using both SPSS and JMP computer packages. The data was double entered and checked for any errors.

### *7.6.1 Questionnaire data*

Each possible answer to each question was given a numerical code, which was entered onto SPSS. All variables except for the satisfaction ratings were coded as categorical variables.

The satisfaction ratings (question 17 and 18 of the questionnaire) were coded as continuous variables.

### *7.6.2 Pain scores*

These were entered directly from the data collection sheet and coded as continuous variables.

## 7.7 STATISTICAL METHODS

### *7.7.1 Questionnaire data*

Descriptive statistics were produced to present patient demographics and patient responses to the questions in the questionnaire. Associations were tested with the Chi-square test and results were reported where significant ($p < .05$). The chi-square value, the degrees of

freedom and the p value are reported for each chi-square test. The following section provides an overview of the chi-square test.

### *Chi-square test ( $\chi 2$)*

The chi-square test is a non-parametric test of statistical significance used to assess whether a relationship exists between two nominal level variables. The chi-square test is computed by two sets of frequencies; (1) those observed in the collected and (2) those that would be expected if there were no relationship between two variables. The expected frequencies are calculated on the basis of the observed total frequencies for the rows and columns of a contingency table.[279] The null hypothesis is that there is no association between the two variables and the alternate being that there is an association. Eighty per cent of the cells in the contingency table should have expected frequencies greater than 5 and all cells should have expected frequencies greater than one.[280] To convert the chi-square statistic into a p value involves determining the relevant degrees of freedom and looking up the value in a table of chi-square distribution. The degrees of freedom are equal to the product of the number of rows in the table minus one and the number of columns minus one.[281]

### *7.7.2 Pain scores*

Boxplots and linegraphs were used to present the data graphically. T tests were performed on the data to test for differences in mean pain scores within hospitals pre and post intervention for the five 12 hour time periods post surgery. The mean, confidence interval, t value and p value are reported. Multiple linear regression was performed on the pain scores to evaluate how pain scores are influenced by various other variables measured. The parameter estimate, standard error, t ratio, p value, confidence intervals and analysis of variance table are reported

for each regression performed. The following section provides an overview of each of the above.

***Two sample independent t tests***

The two sample independent t test was used on this data set. The t test is a parametric statistical test for analysing the difference between two means.[282] The sample mean is an estimate of the population mean. The standard error provides a measure of how far from the true value the estimate is likely to be.[283] With independent groups of observations the researcher is interested in the mean difference between the groups however the variability between subjects becomes important. The standard error of the mean of one group of observations is derived from the standard deviation of the data and hence the variance. The two sample independent t test investigates the relationship between the means of two independent samples. There is an underlying assumption that the distributions of both samples are normal with equal standard deviations.[284] In hypothesis testing one assumes that the null hypothesis is true and then gathers evidence to disprove it. To convert the t statistic into a probability statement or p value the t tables are looked up.[285]

***Confidence Intervals***

Confidence intervals constructed around the mean provide a range of values within which it can be confidently taken includes the true value.

***Boxplots***

Boxplots show the distribution of the data. These plot the median, the 25$^{th}$ percentile, the 75$^{th}$ percentile and the values that are far removed from the rest. The lower boundary of the box

shows the 25th percentile and the upper boundary the 75th percentile. From the median the central tendency of the data can be determined.[286]

***Multiple linear regression***[287]

Multiple linear regression investigates the way one variable is influenced by several variables. Multiple regression analysis yields a regression model in which the dependent (or outcome) variable is expressed as a combination of the explanatory variables (sometimes known as the predictor or covariates).

**Explanation of Multiple Linear Regression Model**

The **Regression Co-Efficient** lists the parameter estimates for each term. They are the co-efficients of the linear model and are determined by least squares.

The **Standard Error** is an estimate of the standard deviation of the distribution of the parameter estimates. It is used to construct the t-tests and confidence intervals for the parameters.

The **t test**. The statistical significance of each variable is obtained by calculating the ratio of the regression co-efficient to its standard error and relating this value to the t distribution with n - k - 1 degrees of freedom, where n is the sample size and k is the number of variables in the model. The t statistic, which is calculated, as b/se(b), where b is the regression co-efficient, is

equal to the square root of the F statistic for the extra variability explained by the present model in comparison with the model excluding the particular variable. The t test for each variable indicates whether omitting that variable would lead to a significant loss of information.

The **95% Confidence Interval** is the upper and lower confidence limits for all model parameters.

**Goodness to Fit**

How well a model "fits" the data or how well the model predicts the dependent variable can be assessed by considering the total sums of squares that can be explained by the model. The F test is the only way to assess whether a model explains a significant proportion of the variability. $R^2$ assesses crudely how well the model fits the data overall, but how well the model predicts values of the dependent variable for individuals should be examined. The residuals should be studied.

The residual standard deviation is a measure of the average difference between the observed y values and those predicted or fitted by the model. The residuals should be checked for a normal distribution and that the model is good throughout the range of values of the dependent variable. The residuals can be plotted against the fitted values. No pattern should be discernible. In particular the variability of the residuals should be constant across a range of the fitted values.

**Assumptions of Multiple Regression Model**

The model assumes that the relationship between the dependent variable and each continuous explanatory variable is continuous. The model assumes that the effects of each variable are independent, so that the effect is the same regardless of the values of the other variables in the model.

# Chapter 8

## Data Analysis and Results

### *Introduction*

The analysis and results are presented in this chapter in three sections. The first section 8.1 describes the response of the nurses in the intervention hospital to the implementation of the pain programme. The second section 8.2 describes the results of the patient questionnaire. The third section 8.3 describes the pain score analysis.

Section 1 (8.1): response to implementation of pain programme.

Section 2 (8.2): results of questionnaire pre and post intervention.
*Section 1: Prior to surgery*
*Section 2: Twenty-four hours post surgery*
*Section 3: Day of discharge*

Section 3 (8.3): results of pain score analysis.
*Section 1: Descriptive statistics, boxplots, line graphs, T tests*
*Section 2: Multiple linear regression*

## 8.1 RESPONSE TO THE PAIN PROGRAMME

The pain programme has been described in chapter 6. The implementation of this programme was conducted over a ten-month period. The programme was introduced into the intervention hospital only and the responses in this section relate therefore to the nurses in the intervention hospital only. The primary evaluation of the intervention is described in the following two sections (8.2 and 8.3) from the analysis of the patients' pain scores and the analysis of the questionnaire. The aim of this section is therefore to provide a general impression of the acceptance and reception that the intervention received.

*Educational Programme*

The educational programme involved running short-pain courses and providing regular in-service talks on pain management. Eighty-five nurses from the surgical floors attended the education programme. The written evaluations showed enthusiasm for the lectures. The course was rated as very relevant by 70%, relevant by 25% and not relevant by 5%. Over 30% of the nurses attending said that more time would add to the course and that annual refresher courses would be useful.

*Pain score measurement*

A pain score was added to the vital signs chart for all patients. Nurses were encouraged to rate pain at the same time as checking patients' temperature, pulse and blood pressure. This pain rating was between 0 and 10, 0 being no pain and 10 worst pain imaginable. To supplement this a pain chart was devised for patients with more complex pain. Systematic use of a pain score to describe pain was a new concept for many of the nurses and was received with a mixed response. However with much encouragement and follow up the regular use of pain scores became acceptable.

*Reading material*

A broad range of reading material was provided in a specially marked folder on all surgical wards. The folder was received with enthusiasm.

*National Pain Conference*

The author organised the first National Pain Conference for nurses in the Republic of Ireland. The aim of this was to profile experts on pain within the hospital, to provide a national forum for pain management and to provide information on pain management. Over 200 nurses attended the day. Twenty-five nurses from the intervention hospital attended. The day was evaluated as excellent and very relevant by over 90% of the nurses attending.

*Poster display*

A poster display illustrating a number of pain topics was held at the hospital's ward sisters' and staff nurses' annual study days. One hundred per cent of the ward sisters and 50% of the staff nurses attend these days. The display received a lot of attention and interest.

## 8.2 RESULTS OF PATIENT QUESTIONNAIRE

This section describes the results of the patient questionnaire. Participation in the study was invited from 838 patients. Thirty-eight patients were excluded from the study (see table 13). Twenty of these were anxious about their surgery and did not wish to participate in a study, they felt that answering a questionnaire would make them more anxious. Four patients gave no reason why they did not wish to participate and the remainder had complications or returned to the intensive care unit thus excluding them from the study inclusion criteria.

**TABLE 13** REASONS WHY PATIENTS WERE EXCLUDED FROM DATA ANALYSIS

| REASON FOR EXCLUSION FROM STUDY | NO. | % |
|---|---|---|
| Anxious about surgery | 20 | 52.6% |
| Complications post surgery | 10 | 26.3 |
| Returned to Intensive Care Unit | 4 | 10.5 |
| No reason given | 4 | 10.5 |
| TOTAL | 38 | 100 |

The results of the questionnaires from the remaining 800 patients are presented in this section. 9138 pain scores were obtained and 800 questionnaires completed (see figure 9).

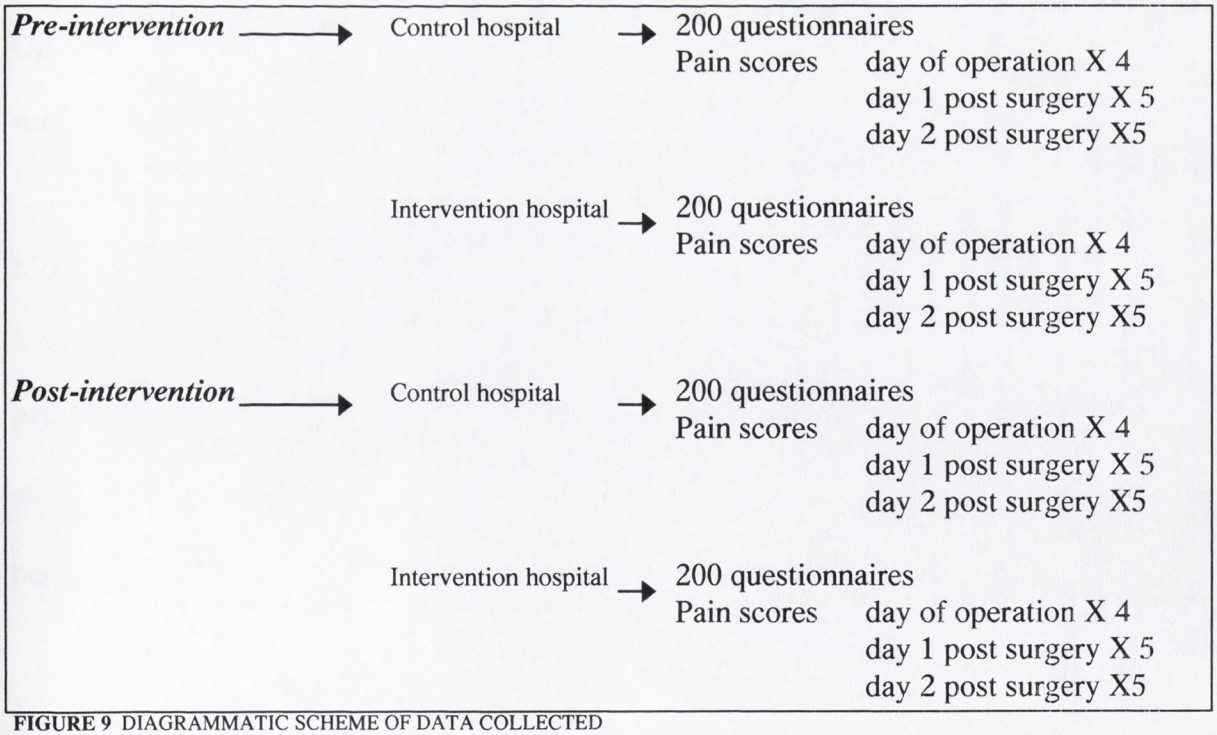


**FIGURE 9** DIAGRAMMATIC SCHEME OF DATA COLLECTED

Descriptive statistics were produced to present the demographics of the patients and their responses to the questions in the questionnaire. Associations were tested with the Chi-square test and results reported where significant ($p < .05$).

This section is presented in two parts:

Part 1: (8.2.1) demographics and patient details

Part 2: (8.2.2) results of questionnaire

*Section 1: Prior to surgery*
*Section 2: Twenty-four hours post surgery*
*Section 3: Day of discharge*

Tables and figures are presented for both the control and the intervention hospital at the two-time periods, pre and post intervention, except where otherwise detailed.

### *8.2.1 Demographics and patient details*

#### *Operation category*

Operations were classified as either category 1 (major surgery) or category 2 (intermediate surgery) as described in chapter 6.

More category 2 surgery than category 1 surgery patients were represented, pre and post intervention both between and within hospitals (figure 10) reflecting the fact that more patients went for intermediate surgery during the time periods for data collection in this study. There was no statistical association (chi-square test ( $\chi 2$)) for category type within or between hospitals pre and post intervention (table 14).

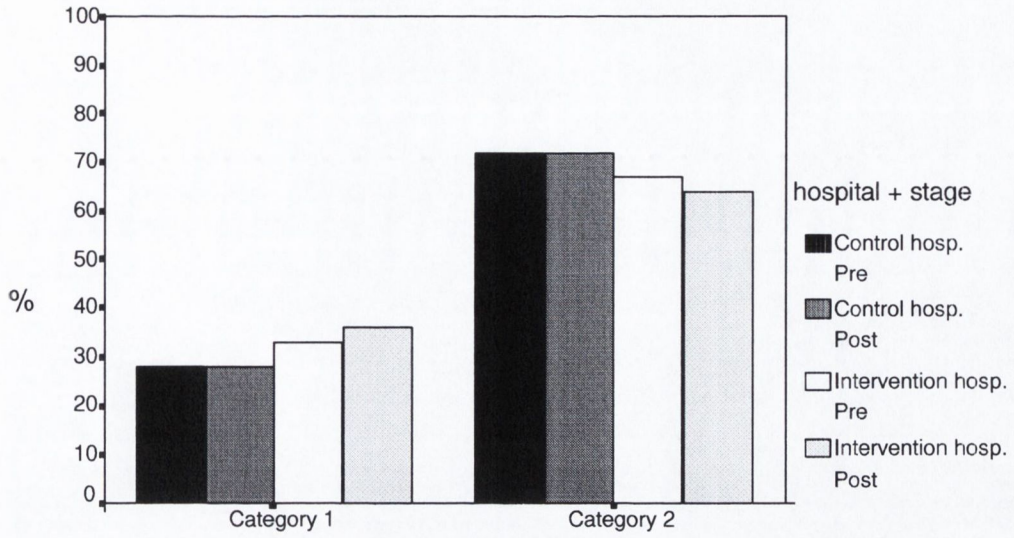


**FIGURE 10** HOSPITAL BY OPERATION TYPE PRE AND POST INTERVENTION

**TABLE 14** CHI-SQUARE TEST FOR OPERATION CATEGORY WITHIN AND BETWEEN HOSPITALS PRE AND POST INTERVENTION

| | $\chi 2$ | DF | Significance |
|---|---|---|---|
| Operation category by Hospital Pre intervention | 1.17 | 1 | .27 |
| Operation category by Hospital Post intervention | 2.94 | 1 | .08 |
| Operation category Intervention hospital Pre and Post | .398 | 1 | .53 |
| Operation category Control hospital Pre and Post | .00 | 1 | 1.0 |

### *Operation types*

Operations were either orthopaedic, gynaecological, urological or general surgery. Table 15 outlines the types of operations per hospital at each stage. The table demonstrates that within hospitals the number of patients going for each operation type was comparable. There were no significant associations (chi-square tests) for operation type within hospital.

**TABLE 15** OPERATION TYPE PER HOSPITAL PRE AND POST INTERVENTION

| | ***Intervention hosp. pre*** | ***Intervention hosp. post*** | ***Control hosp. Pre*** | ***Control hosp. Post*** |
|---|---|---|---|---|
| Urology | 52 (26%) | 48 (24%) | 86 (43%) | 91 (45.5%) |
| Gynaecology | 28 (14%) | 31 (15.5%) | 7 (3.5%) | 6 (3%) |
| General Surgery | 20 (10%) | 21 (10.5%) | 31 (15.5%) | 25 (12.5%) |
| Orthopaedic | 100 (50%) | 100 (50%) | 76 (38%) | 78 (39%) |

*Patient Demographics*

Patient demographics presented are:- age-group, gender and whether patients had previous surgery. The tables presented show that no significant associations were found within hospitals for age-group or gender mentioned (chi-square tests).

*Age-groups*

Ages ranged from 18 to 99 years. Overall mean age was 54.5, median 54 and standard deviation 17.2. Ages were divided into three groups, group 1 (<30years), group 2 (31 - 60 years) and group 3 (61+ years). Frequencies of age-groups are presented in figure 11. There was no statistical association (chi-square test) for age groups within or between hospitals pre and post intervention (table 16).

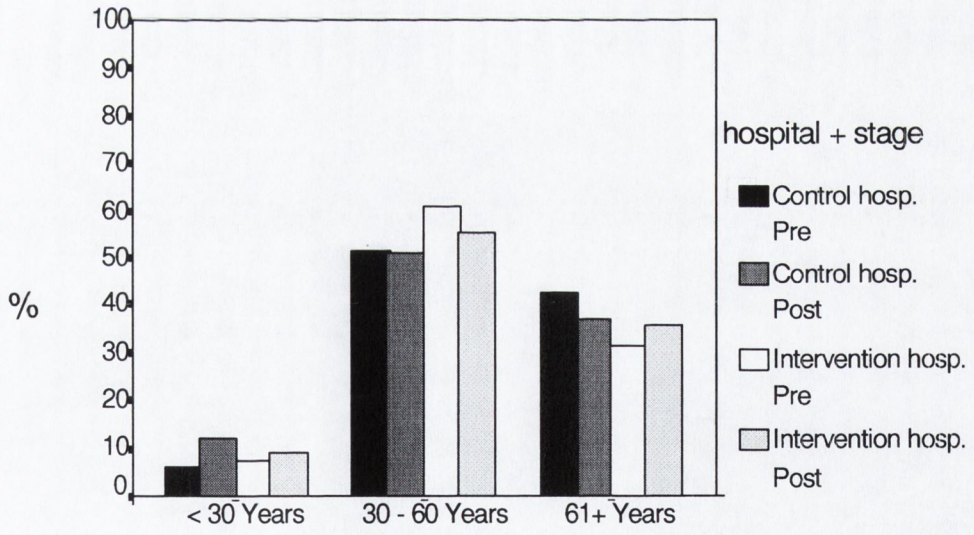


**FIGURE 11** AGEGROUP BY HOSPITAL PRE AND POST INTERVENTION

**TABLE 16** CHI-SQUARE TEST FOR AGEGROUPS WITHIN AND BETWEEN HOSPITALS PRE AND POST INTERVENTION

| | $\chi 2$ | DF | Significance |
|---|---|---|---|
| Age-Group by Hospital Pre intervention | 5.2 | 2 | .07 |
| Age-Group by Hospital Post intervention | 1.29 | 2 | .52 |
| Age-Group Intervention hospital Pre and Post | 1.26 | 2 | .53 |
| Age-Group Control hospital Pre and Post | 4.76 | 2 | .09 |

***Gender***

Patients who fulfilled the study inclusion criteria were selected consecutively from theatre lists. More males participated in the study at each stage reflecting that for the study time periods more males fulfilling the inclusion criteria underwent surgery than females (figure 12). There was no statistical association (chi-square test) for gender within or between hospitals pre and post intervention (table 17).

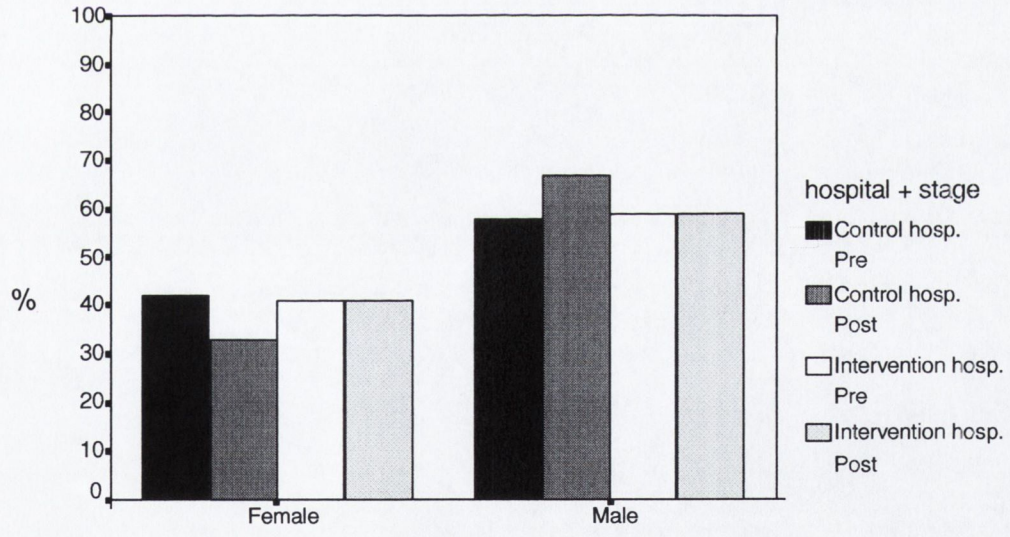


**FIGURE 12** HOSPITAL BY GENDER PRE AND POST INTERVENTION

**TABLE 17** CHI-SQUARE TEST FOR GENDER WITHIN AND BETWEEN HOSPITALS PRE AND POST INTERVENTION

| | $\chi 2$ | DF | Significance |
|---|---|---|---|
| Gender by Hospital Pre intervention | .04 | 1 | .83 |
| Gender by Hospital Post intervention | 2.74 | 1 | .097 |
| Gender Intervention hospital Pre and Post | .000 | 1 | 1.0 |
| Gender Control hospital Pre and Post | 3.45 | 1 | .06 |

***Previous surgery***

The majority of patients had previous surgery prior to this admission to hospital (figure 13).

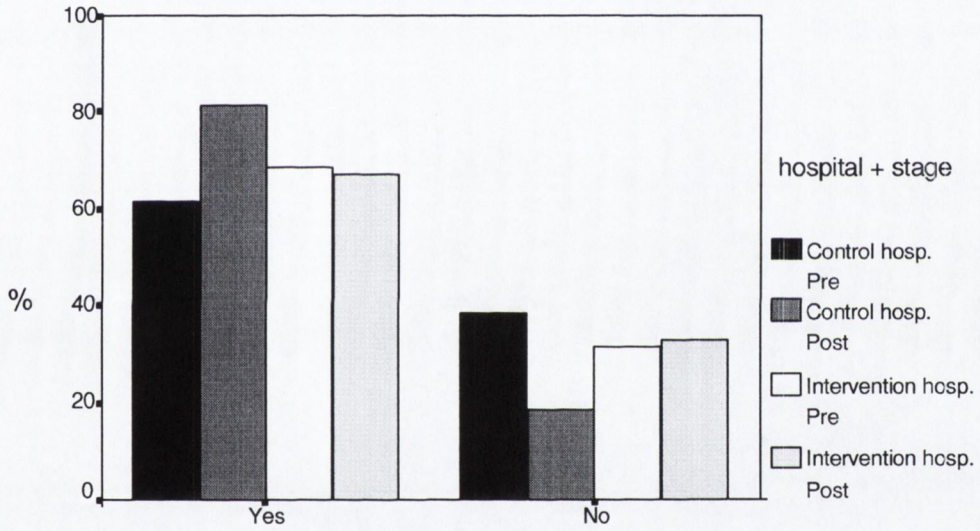


**FIGURE 13** HOSPITAL BY PREVIOUS SURGERY PRE AND POST INTERVENTION

***Pain prior to surgery***

Over 40% of patients had pain prior to surgery (figure 14) at all stages of the study.

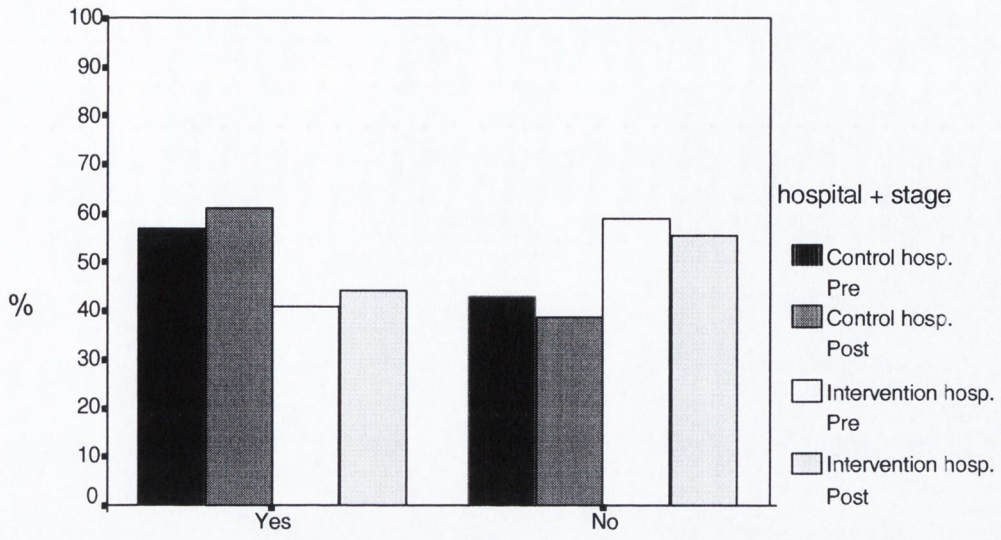


**FIGURE 14** PAIN PRIOR TO SURGERY BY HOSPITAL PRE AND POST INTERVENTION

***Summary from Part 1 – Patient demographics and patient details***

These results indicate there were no statistically significant associations within or between hospitals for the major patient demographics. Statistically significant associations for these prognostic factors at this stage of the analysis would significantly reduce the comparability of the two hospitals.

### *8.2.2 Results of questionnaire*

The questionnaire was divided into three sections:

*Section 1: Prior to surgery*
*Section 2: Twenty-four hours post surgery*
*Section 3: Day of discharge.*

Each section is presented separately. The results of each question are described, significant chi-squares tests reported ($p<.05$) and where necessary an explanation of the question is given.

**Section 1 Prior to surgery**

Patients gave information regarding their expectations of pain, their expectations of pain relief, when they were most likely ask for a pain-killer and after asking how soon would they expect to receive it.

***Patients' expectations of pain***

The majority of people did expect pain (58%-65%) following surgery (figure 15). Patients who expected pain, anticipated it would be either mild, moderate or severe with over 20% unsure of how much pain to expect (figure 16).

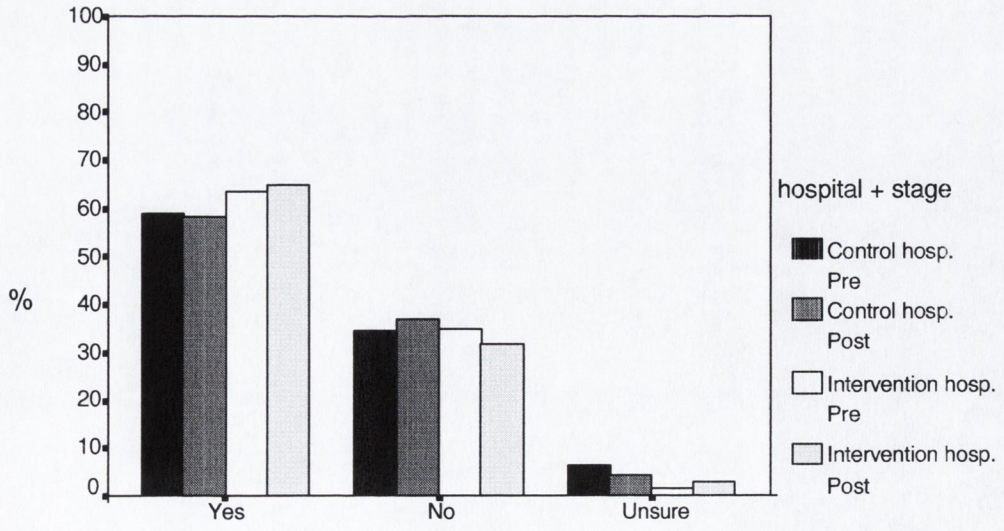


**FIGURE 15** PATIENTS' EXPECTATIONS OF PAIN BY HOSPITAL PRE AND POST INTERVENTION

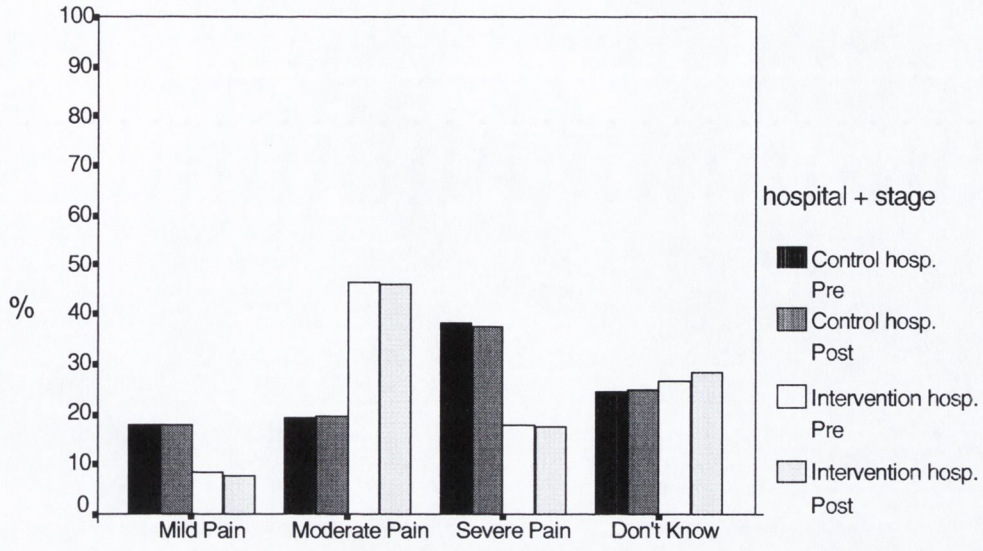


**FIGURE 16** AMOUNT OF PAIN PATIENTS' EXPECT BY HOSPITAL PRE AND POST INTERVENTION

Females were significantly more likely to expect pain after surgery than males (table 18).

**TABLE 18** CHI-SQUARE TEST BETWEEN GENDER AND EXPECTION OF PAIN

| | Males | % | Females | % |
|---|---|---|---|---|
| Yes | 283 | 58.2 | 209 | 66.6 |
| No | 183 | 37.7 | 94 | 29.9 |
| Do not know | 20 | 4.1 | 11 | 3.5 |
| TOTAL | 486 | 100% | 314 | 100% |

Chi-Square result $\chi'2 = 5.61$ df 2 P = .059

***Relief expected from medication given for pain***

Over 50% of patients at all stages of the study expected a lot of relief from any pain-relieving medication that they might be given (figure 17).

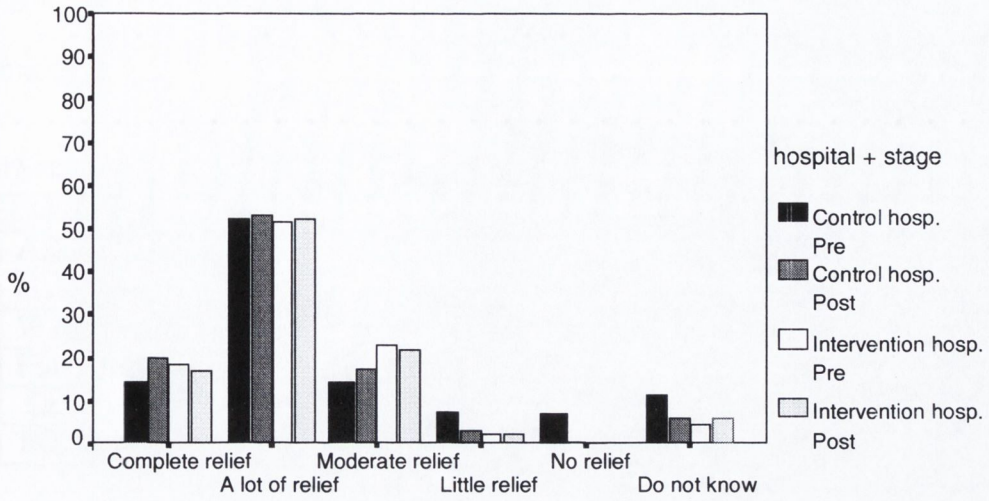


**FIGURE 17** AMOUNT OF PAIN RELIEF PATIENTS EXPECT BY HOSPITAL PRE AND POST INTERVENTION

### *When patients were more likely to ask for a pain killer*

The majority of patients felt that they would ask for a painkiller when their pain became severe (figure 18).

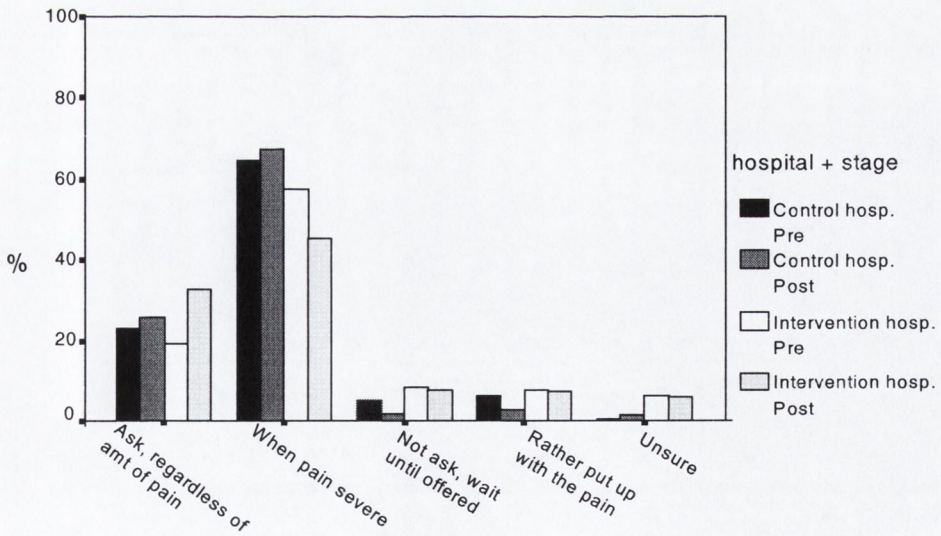


**FIGURE 18** WHEN PATIENTS WOULD MOST LIKELY ASK FOR A PAIN KILLER AFTER THEIR OPERATION

Significantly more males than females said that they would ask for a painkiller when their pain became severe (table 19).

**TABLE 19** CHI-SQUARE TEST BETWEEN GENDER AND WHEN PATIENTS SAID THEY WOULD ASK FOR A PAINKILLER

| | Male | % | Female | % |
|---|---|---|---|---|
| Ask, regardless of amount of pain | 119 | 24.5 | 84 | 26.8 |
| Ask for another when pain became severe | 296 | 60.9 | 174 | 55.4 |
| Wait for another to be offered or given | 34 | 7 | 14 | 4.5 |
| Put up with pain rather than have medication | 22 | 4.5 | 28 | 9 |
| Do not know | 15 | 3.1 | 14 | 4.5 |
| TOTAL | 486 | 100% | 314 | 100% |

Chi-Square result $\chi'2 = 10.28$ df 4 P = .035

***How soon patients expected a painkiller after requesting it***

Most patients would expect to be given a pain killer either immediately or within five minutes of requesting it (figure 19).

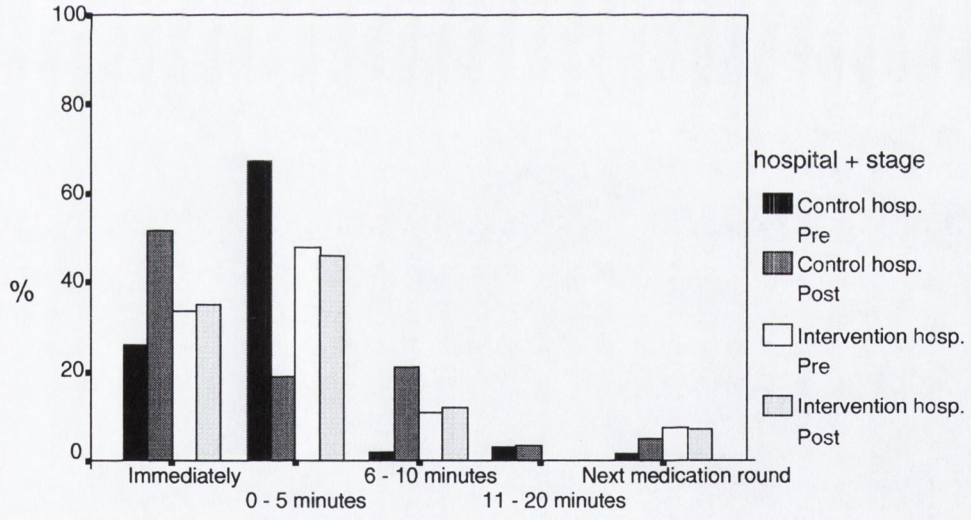


**FIGURE 19** WHEN PATIENTS EXPECTED TO RECEIVE A PAIN KILLER

**Summary Section 1 – Questionnaire prior to surgery**

In general patients expected pain and had definite ideas about when they would ask for pain relief and their expectations of that pain relief. Females differed significantly from males in their expectations of pain and how they perceived they would request pain relief.

**SECTION 2 Twenty four hours post surgery**

Patients described how much pain they had in the first 24 hours post surgery, the amount of pain relief that they received from their pain killers, the length of time their pain had been completely relieved, when they asked for a pain killer and if pain prevented sleep.

***Amount of pain described in the first 24 hours post surgery***

At twenty-four hours after surgery less than 9% of patients described their pain as severe with the majority of patients describing their pain as either mild or moderate (figure 20).

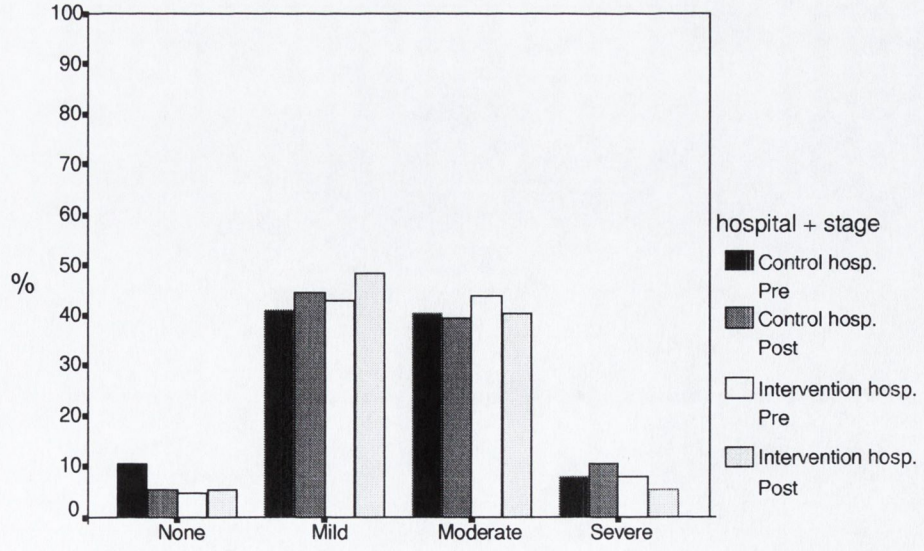


**FIGURE 20** AMOUNT OF PAIN EXPERIENCED BY PATIENTS IN THE FIRST 24 HOURS POST SURGERY

There was a significant association between gender (table 20) and the amount of pain patients said that they had experienced in the first 24 hours post surgery.

Significantly more males reported no pain or mild pain.

**TABLE 20** CHI-SQUARE TEST BETWEEN GENDER AND THE AMOUNT OF PAIN EXPERIENCED POST SURGERY

| | Males | % | Females | % |
|---|---|---|---|---|
| No pain | 38 | 7.8 | 15 | 4.8 |
| Mild pain | 227 | 46.7 | 127 | 40.5 |
| Moderate pain | 191 | 39.3 | 138 | 44 |
| Severe pain | 30 | 6.2 | 34 | 10.8 |
| TOTAL | 486 | 100% | 314 | 100% |

Chi-Square result $\chi'2 = 10.52$ df 3 P = .014

***Amount of pain relief from pain killers at 24 hours***

The majority of patients experienced a lot of relief from their painkillers during the first 24 hours post surgery (figure 21) however less than 20% of patients had their pain completely relieved since return from theatre (figure 22).

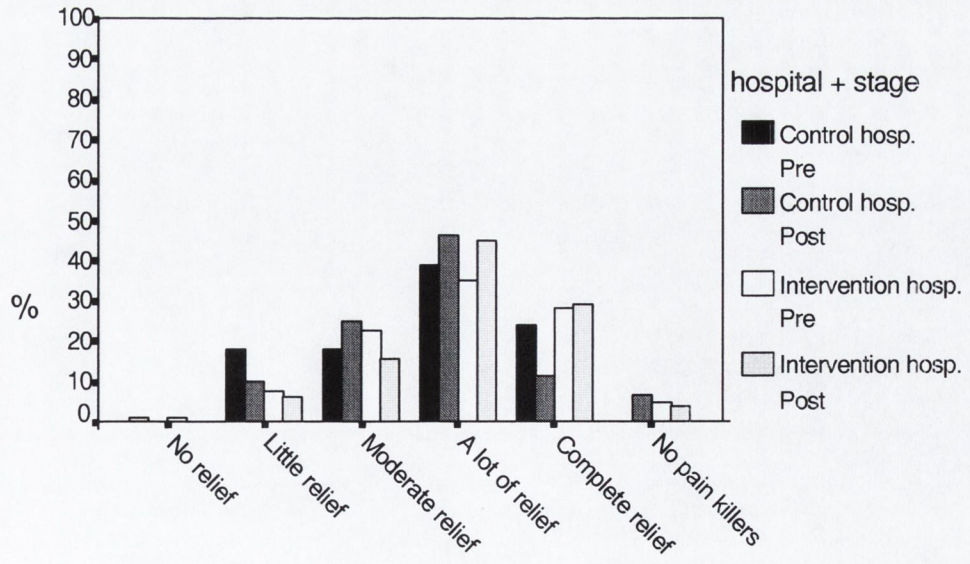


**FIGURE 21** PAIN RELIEF THAT PATIENTS' EXPERIENCED

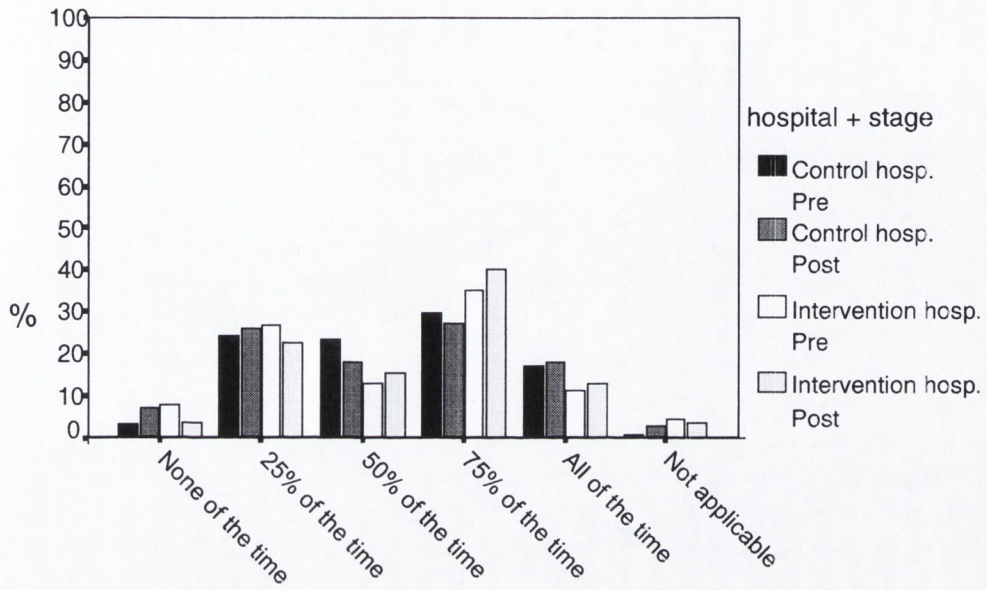


**FIGURE 22** LENGTH OF TIME PAIN WAS COMPLETELY RELIEVED POST SURGERY

***When did patients request a painkiller?***

The majority of patients requested a pain-killer when pain became severe (figure 23). Significantly more patients in the intervention hospital asked for a pain-killer regardless of the amount of pain that they had post intervention (table 21).

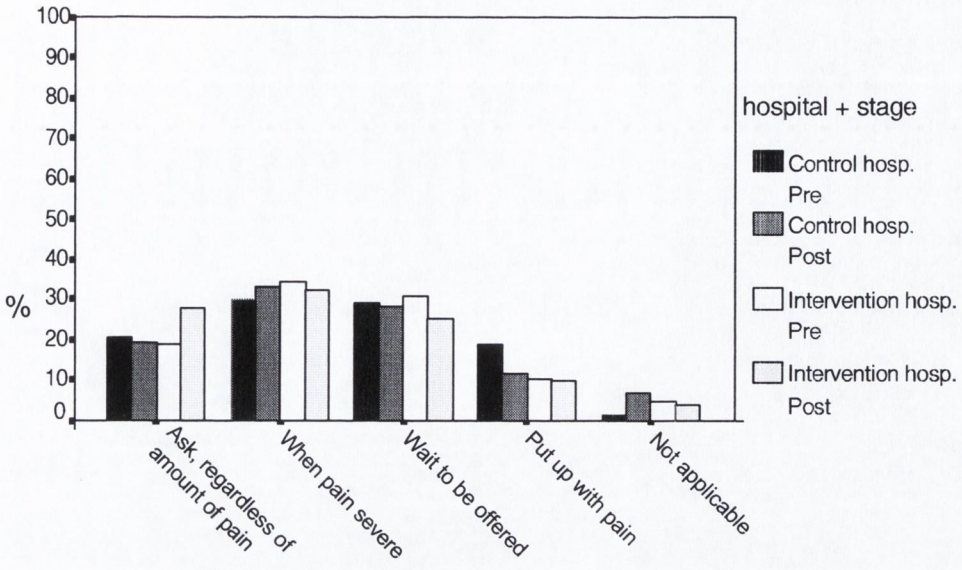


**FIGURE 23** WHEN PATIENTS ASKED FOR A PAIN KILLER AFTER THEIR OPERATION

**TABLE 21** CHI-SQUARE TEST FOR TIME OF PATIENTS' REQUEST FOR A PAIN KILLER PRE AND POST INTERVENTION IN THE INTERVENTION HOSPITAL

| | Pre | % | Post | % |
|---|---|---|---|---|
| Ask, regardless of amount of pain | 39 | 19.5 | 66 | 33 |
| Ask for another when pain became severe | 115 | 57.5 | 91 | 45.5 |
| Wait for another to be offered or given | 17 | 8.5 | 16 | 8 |
| Put up with pain rather than have medication | 16 | 8 | 15 | 7.5 |
| Did not know | 13 | 6.5 | 12 | 6 |
| TOTAL | 200 | 100% | 200 | 100% |

Chi-Square result $\chi'2 = 9.84$ df 4 P = .04

***Did pain interrupt patients' sleeping pattern?***

Twenty two to forty per cent of patients said that pain prevented them from sleeping (figure 25) and 40 to 50% of patients said that pain woke them up (figure 25).

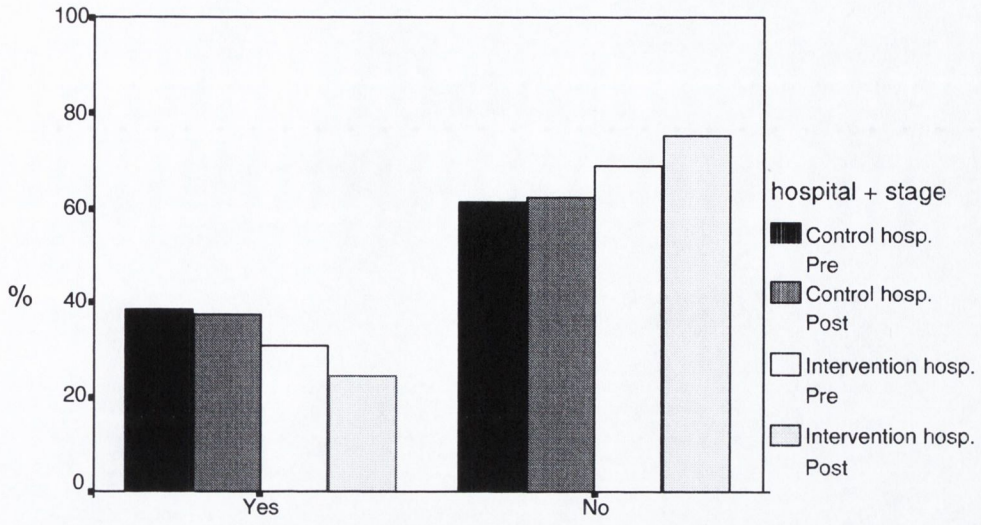


**FIGURE 24** WHETHER PAIN PREVENTED PATIENTS FROM SLEEPING

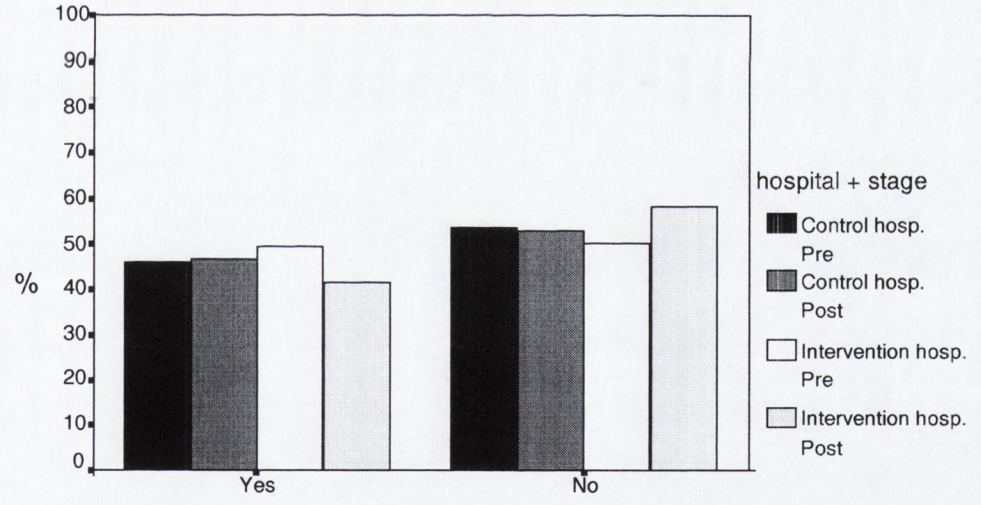


**FIGURE 25** WHETHER PAIN WOKE PATIENTS UP

### *Pain score (VAS 0 – 10) at time of questionnaire*

The median pain score at the time of answering the questionnaire was less than 3.5 as outlined in the following boxplot (figure 26). Patients' pain was in general mild to moderate

at this stage however the range of pain scores indicates that some patient had more severe pain rated up to 7 on the VAS scale.

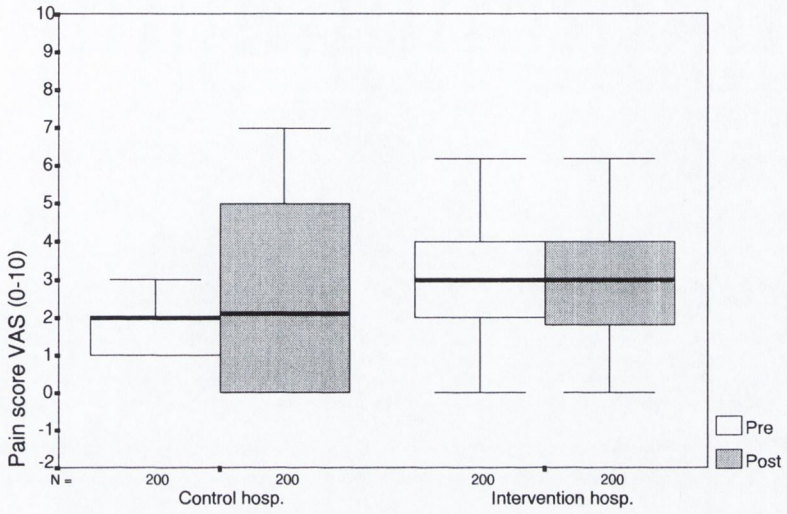


**FIGURE 26** BOXPLOT OF PAIN SCORES AT TIME OF ADMINISTRATION OF QUESTIONNAIRE PRE AND POST INTERVENTION

### *Least and worst pain score in last 24 hours?*

Patients recalled their least and worst pain score for the first 24 hours post surgery. Worst median pain was recalled as greater than 6 at all stages of the study (figure 28) while least median pain score was less than 3 (figure 27).

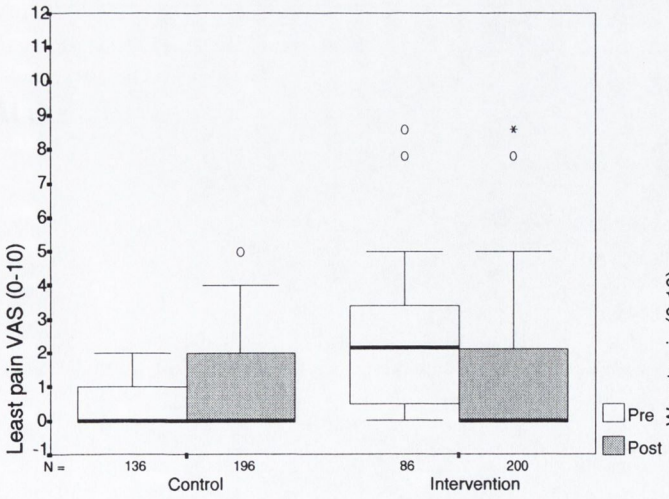


**FIGURE 27** LEAST PAIN IN FIRST 24 HRS PRE AND POST INTERVENTION

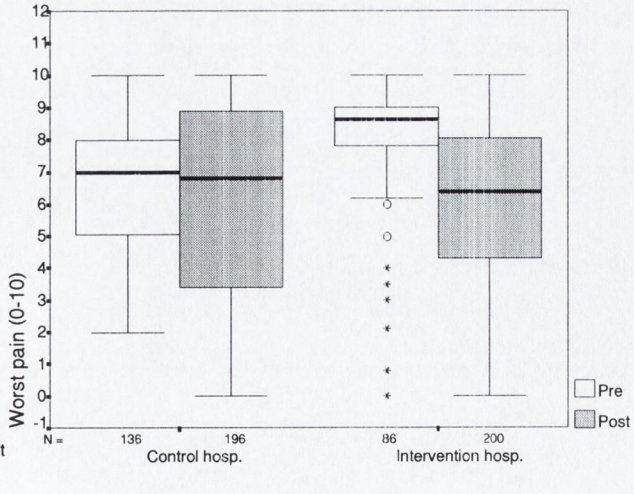


**FIGURE 28** WORST PAIN IN FIRST 24 HRS PRE AND POST INTERVENTION

Extreme outliers in figures 27 and 28 were from patients who had vaginal hysterectomies, hysterectomies, dynamic hip screws and one TURP.

**Summary Section 2 – Twenty four hours post surgery**

Most patients described their pain as mild or moderate and said that they received a lot of relief from their painkillers however many patients were either woken up or did not sleep due to pain.

In general patients requested a painkiller when pain became severe. However significantly more patients in the intervention hospital asked for a pain killer regardless of the amount of pain that they had following the intervention.

Worst median pain was recalled at greater than 6 and least less than 3 at all stages of the study.

At the time of answering the questionnaire pain was in general mild to moderate.

**SECTION 3 Day of Discharge**

Patients were asked about information given re pain and the adequacy of this information. They were asked if they had any worries about their pain and pain relief, if they had any difficulties describing their pain, whether they would have liked more control over their pain management, if it was possible to become addicted to pain killers in hospital and how satisfied they were with their pain relief and pain management.

***Recall by patients of information given about pain prior to surgery***

Less than 40% of patients at all stages of the study recalled being given information about pain prior to their surgery (figure 29).

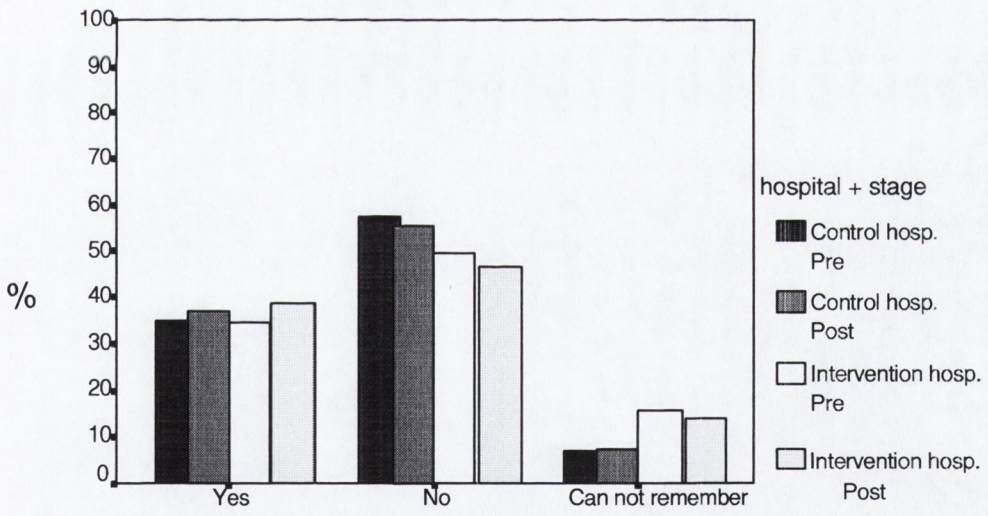


**FIGURE 29** WHETHER PATIENTS REMEMBERED BEING GIVEN INFORMATION ABOUT PAIN PRE-OPERATIVELY

Patients who said they received information re pain pre-operatively recalled the health professionals who gave them that information (table 22). Some patients recalled more than one health professional giving them information.

TABLE 22 THE HEALTH PROFESSIONAL WHOM PATIENTS REMEMBERED GIVING PAIN INFORMATION

| | Intervention hosp. Pre | % | Intervention hosp. Post | % | Control hosp. Pre | % | Control hosp. Post | % |
|---|---|---|---|---|---|---|---|---|
| **Nurse** | 18 | 26.5 | 27 | 35.4 | 30 | 42.8 | 33 | 45.9 |
| **Doctor** | 32 | 47 | 41 | 54.4 | 44 | 62.8 | 41 | 56.7 |
| **Anaesthetist** | 47 | 69 | 51 | 67 | 22 | 31 | 33 | 45.8 |
| **Relative** | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| *N* | 68 | | 76 | | 70 | | 72 | |

The type of information patients recalled being given is presented in table 23. The majority of patients were told that *"they might have some pain, but we will look after it"* .

TABLE 23 THE TYPE OF INFORMATION GIVEN TO PATIENTS PRE AND POST INTERVENTION

| TYPE | Count | % |
|---|---|---|
| You will have no pain | 80 | 28% |
| You might have some pain, but we will look after it | 102 | 35.7% |
| If you have any pain, let us know | 50 | 17.5% |
| If you have any pain we will take care of it | 54 | 18.9% |
| **TOTAL** | **286/ 800** | **100%** |

***Was pre-operative information adequate?***

Most patients felt that information given pre-operatively about pain was adequate (figure 30).

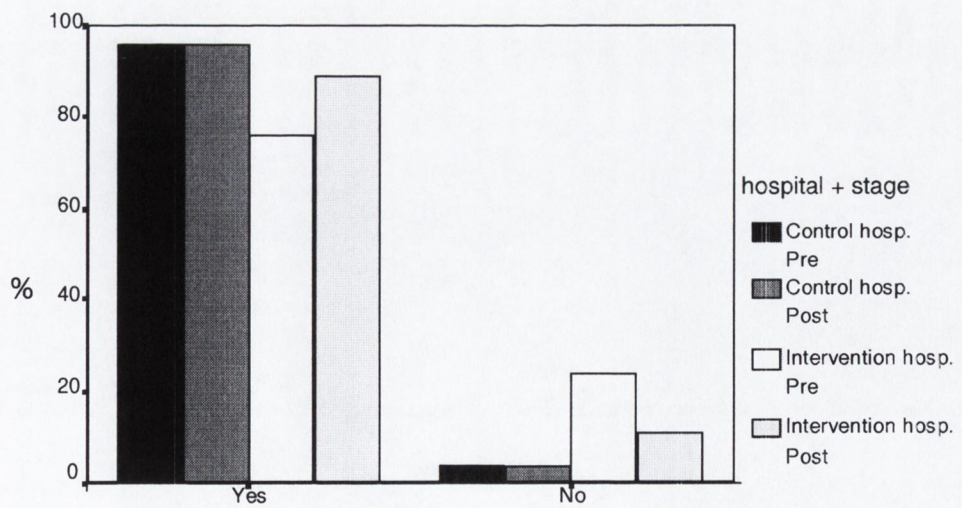


FIGURE 30 WHETHER PATIENTS' FELT THAT THE INFORMATION GIVEN ABOUT PAIN PRE-OPERATIVELY WAS ADEQUATE

Patients in the intervention hospital were significantly more likely to say that the information given pre-operatively post the intervention time period was adequate (table 24).

**TABLE 24** CHI-SQUARE TEST AS TO THE ADEQUACY OF INFORMATION GIVEN PRE-OPERATIVELY IN THE INTERVENTION HOSPITAL PRE AND POST THE INTERVENTION

| | Intervention hosp. Pre | % | Intervention hosp. post | % |
|---|---|---|---|---|
| Yes | 152 | 76 | 178 | 89 |
| No | 48 | 24 | 22 | 11 |
| TOTAL | 200 | 100% | 200 | 100% |

Chi-Square result $\chi 2 = 11.7$ df 1 P = .006

***Did patients receive information about pain after surgery?***

The majority of patients said that they did not they receive information about their pain after their surgery (figure 31).

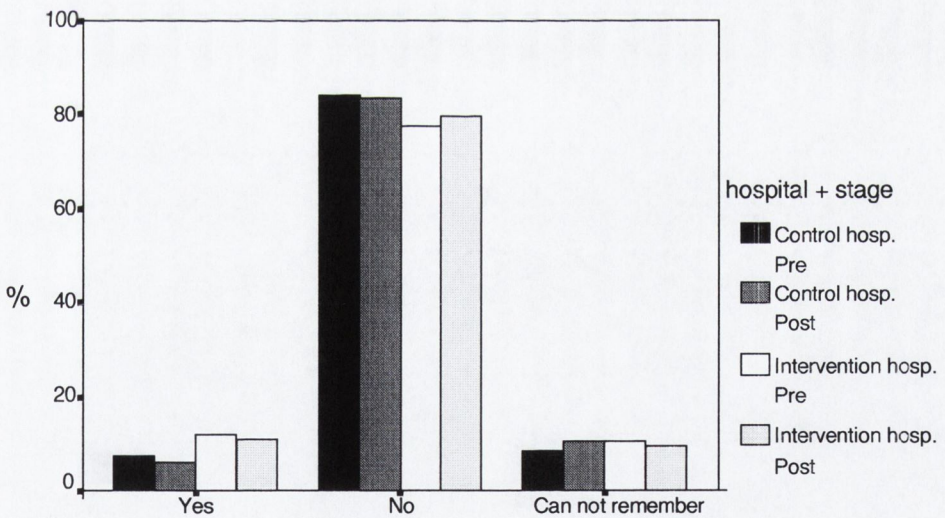


**FIGURE 31** WHETHER PATIENTS WERE GIVEN INFORMATION ABOUT PAIN POST OPERATIVELY

Most patients said that this information adequate (figure 32). Patients in the intervention hospital were significantly more likely to say, that information given post-operatively was adequate post the intervention time period (table 25).

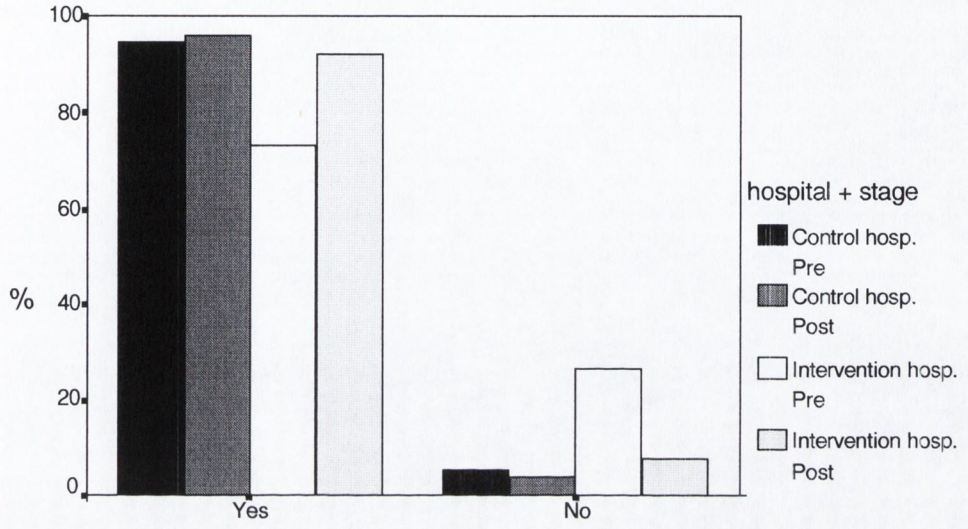


**FIGURE 32** WHETHER PATIENTS FELT THAT THE INFORMATION GIVEN ABOUT PAIN POST-OPERATIVELY WAS ADEQUATE

**TABLE 25** CHI-SQUARE TEST AS TO THE ADEQUACY OF INFORMATION GIVEN POST-OPERATIVELY IN THE INTERVENTION HOSPITAL PRE AND POST THE INTERVENTION

| | Intervention hosp. Pre | % | Intervention hosp. post | % |
|---|---|---|---|---|
| Yes | 147 | 73.5 | 184 | 92 |
| No | 53 | 26.5 | 16 | 8 |
| TOTAL | 200 | 100% | 200 | 100% |

Chi-Square result $\chi 2 = 23.97$ df 1 P = .00

***Did patients feel that their pain was believed?***

Almost 100% felt that their pain was believed (table 26).

**TABLE 26** WHETHER PATIENTS FELT THAT THEIR PAIN WAS BELIEVED BY HOSPITAL PRE AND POST INTERVENTION

| | *Intervention hosp. Pre* | *%* | *Intervention hosp. Post* | *%* | *Control hosp. Pre* | *%* | *Control hosp. Post* | *%* |
|---|---|---|---|---|---|---|---|---|
| ***Yes*** | **199** | **99.5** | **199** | **99.5** | **195** | **97.5** | **196** | **98** |
| ***No*** | **1** | **.5** | **1** | **.5** | **5** | **2.5** | **4** | **2** |
| ***TOTAL*** | **200** | **100%** | **200** | **100%** | **200** | **100%** | **200** | **100%** |

***Did patients have worries about their pain?***

Less than 30% of patients said that they had worries about their pain (figure 33).

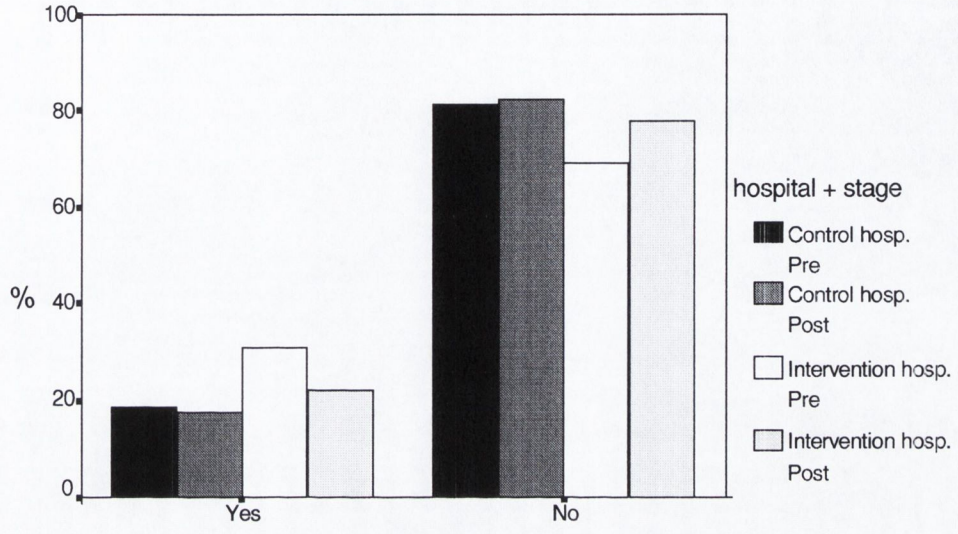


**FIGURE 33** WHETHER PATIENTS HAD WORRIES ABOUT THEIR PAIN

Patients in the intervention hospital post intervention were significantly more likely to say that they did not have worries about their pain post intervention (table 27).

**TABLE 27** CHI-SQUARE TEST AS TO WHETHER PATIENTS IN THE INTERVENTION HOSPITAL WERE LIKELY TO HAVE WORRIES ABOUT THEIR PAIN PRE AND POST INTERVENTION

| | Intervention hosp. Pre | % | Intervention hosp. post | % |
|---|---|---|---|---|
| Yes | 62 | 31 | 44 | 22 |
| No | 138 | 69 | 156 | 78 |
| TOTAL | 200 | 100% | 200 | 100% |

Chi-Square result $\chi 2 = 4.1$ df 1 P = .04

***Did patients have worries about their pain relief?***

Less than 25% said that they had worries about their pain relief. (figure 34)

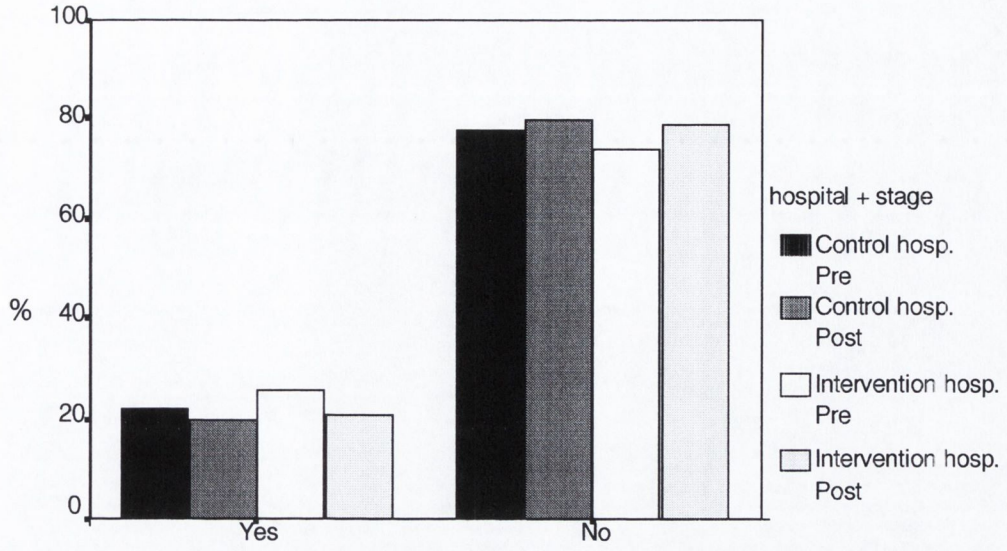


**FIGURE 34** WHETHER PATIENTS HAD WORRIES ABOUT THEIR PAIN RELIEF

***Did patients have difficulty describing the nature of their pain?***

Most patients said that did not have difficulty describing the nature of their pain. (figure 35).

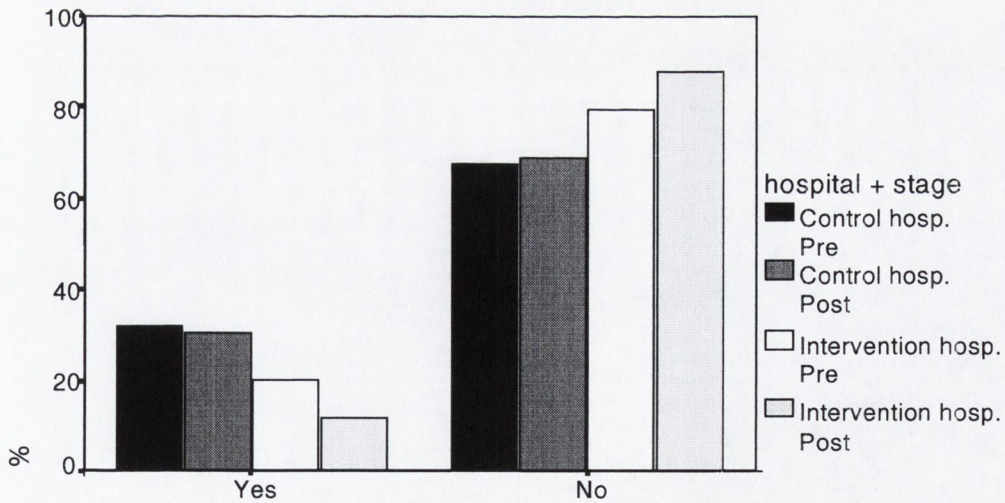


**FIGURE 35** WHETHER PATIENTS HAD DIFFICULTY DESCRIBING THE NATURE OF THEIR PAIN

Patients in the intervention hospital were significantly less likely to have difficulty describing

the nature of their pain post surgery post the intervention (table 28).

**TABLE 28** CHI-SQUARE TEST AS TO WHETHER PATIENTS IN THE INTERVENTION HOSPITAL WERE LIKELY TO HAVE DIFFICULTY DESCRIBING THE NATURE OF THEIR PAIN PRE AND POST INTERVENTION.

| | Intervention hosp. Pre | % | Intervention hosp. post | % |
|---|---|---|---|---|
| Yes | 41 | 20.5 | 24 | 12 |
| No | 159 | 79.5 | 176 | 88 |
| TOTAL | 200 | 100% | 200 | 100% |

Chi-Square result $\chi 2 = 5.3$ df 1 P = .02

***Did patients have difficulty describing the intensity of their pain?***

The majority of patients said that they did not have any such difficulty (figure 36).

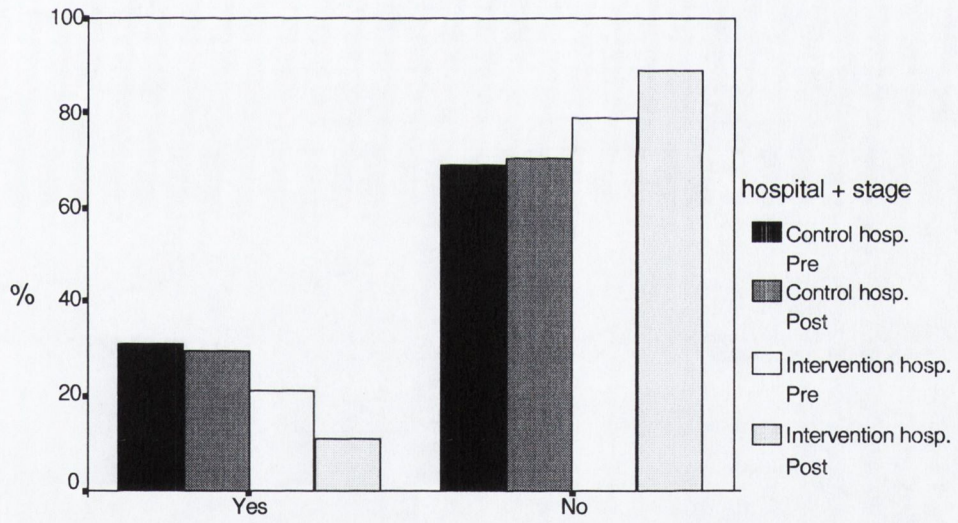


**FIGURE 36** WHETHER PATIENTS HAD DIFFICULTY DESCRIBING THE INTENSITY OF THEIR PAIN

Tests of association within hospitals pre and post intervention (table 29) showed that patients in the intervention hospital post intervention were significantly less likely to have difficulty describing the intensity of their pain.

**TABLE 29** CHI-SQUARE TEST AS TO WHETHER PATIENTS IN THE INTERVENTION HOSPITAL WERE LIKELY TO HAVE DIFFICULTY DESCRIBING THE INTENSITY OF THEIR PAIN.

| | Intervention hosp. Pre | % | Intervention hosp. post | % |
|---|---|---|---|---|
| Yes | 42 | 21 | 22 | 11 |
| No | 158 | 79 | 178 | 89 |
| TOTAL | 200 | 100% | 200 | 100% |

Chi-Square result $\chi 2 = 7.44$ df 1 P = .006

***Would patients have liked more control over their pain?***

Less than 50% of patients would like more control over their pain (figure 37). Significantly more females than males would like more control over pain management $\chi 2 = 34.36$ df 1 $p < .001$.

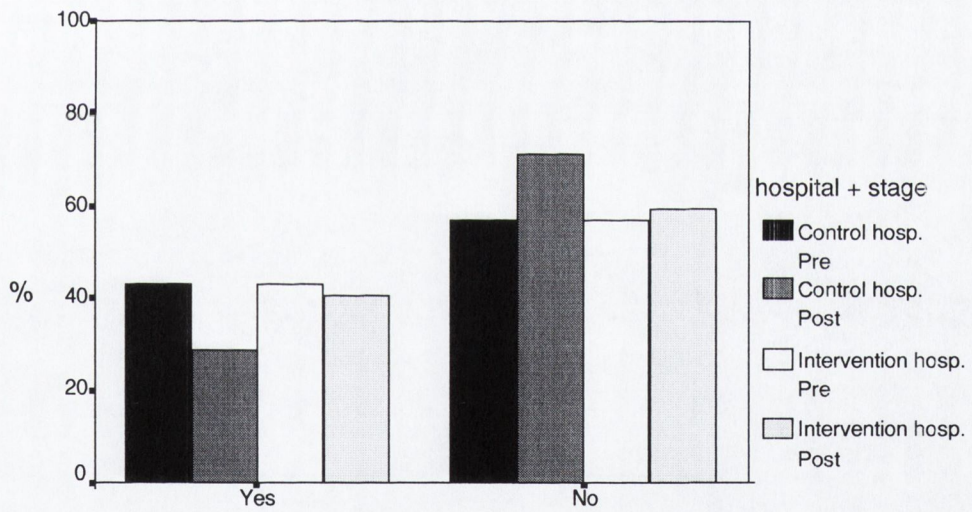


**FIGURE 37** WHETHER PATIENTS WOULD HAVE LIKED MORE CONTROL OVER THEIR PAIN RELIEF

***Did patients think that it is likely that they could become addicted to a painkiller in hospital?***

Almost 50% of patients at all stages of the study thought that it was possible to become addicted to pain killers in hospital (figure 38).

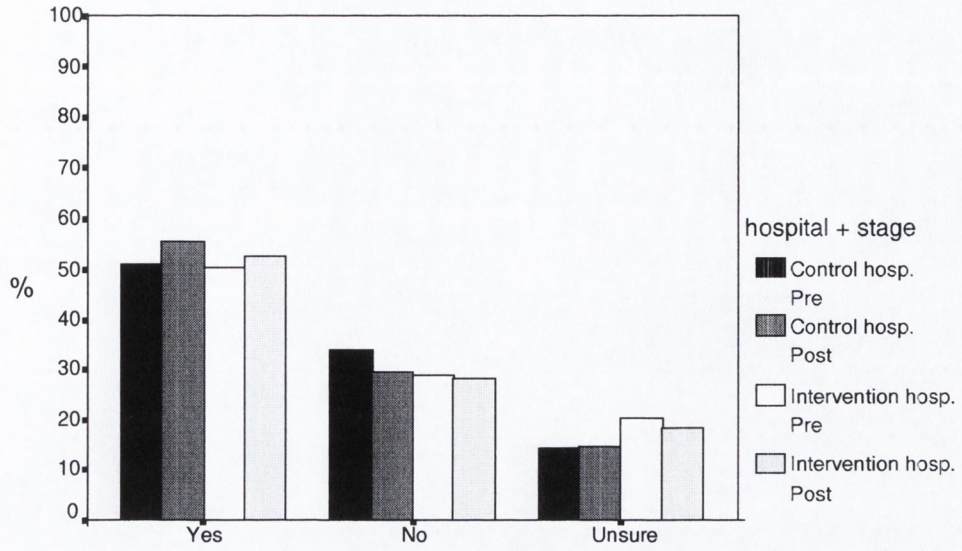


**FIGURE 38** WHETHER PATIENTS FELT THAT IT WAS POSSIBLE TO BECOME ADDICTED TO PAIN KILLERS IN HOSPITAL

***Patients were asked what other sequelae they experienced post surgery.***

Patients experienced other sequelae apart from pain following their surgery. The sequelae are are outlined in table 30 with drowsiness being the most common.

**TABLE 30** OTHER SEQUELAE EXPERIENCED POST SURGERY BY HOSPITAL PRE AND POST INTERVENTION

| | *Intervention hosp. Pre* | *%* | *Intervention hosp. Post* | *%* | *Control hosp. Pre* | *%* | *Control hosp. Post* | *%* |
|---|---|---|---|---|---|---|---|---|
| **NAUSEA** | 73 | 36.5 | 56 | 28 | 58 | 29 | 56 | 28 |
| **VOMITING** | 41 | 20.5 | 33 | 16.5 | 42 | 21 | 44 | 22 |
| **HEADACHE** | 57 | 28.5 | 48 | 24 | 45 | 22.5 | 44 | 22 |
| **DROWSINESS** | 100 | 50 | 107 | 53.5 | 117 | 58.5 | 116 | 58 |
| **DISORIENTATION** | 34 | 17 | 40 | 20 | 33 | 16.5 | 32 | 16 |
| **SORE THROAT** | 42 | 21 | 43 | 21.5 | 32 | 16 | 29 | 14.5 |

Tests of association within hospitals pre and post intervention (table 31) showed that patients in the intervention hospital post intervention were significantly less likely to have nausea.

**TABLE 31** CHI-SQUARE TEST AS TO WHETHER PATIENTS IN THE INTERVENTION HOSPITAL WERE LIKELY TO HAVE NAUSEA PRE AND POST INTERVENTION.

| | Intervention hosp. Pre | % | Intervention hosp. Post | % |
|---|---|---|---|---|
| Yes | 73 | 36.5 | 56 | 28 |
| No | 127 | 63.5 | 144 | 72 |
| TOTAL | 200 | 100% | 200 | 100% |

Chi-Square result $\chi 2$ = 3.3 df 1 P = .069

***Who should decide on pain relief?***

The majority of patients felt that the nurse, doctor and the patient themselves were the biggest decision makers about when they needed a pain killer (table 32).

**TABLE 32** THE HEALTH CARE PROFESSIONALS THAT PATIENTS THOUGHT SHOULD DECIDE WHEN THEY NEEDED A PAIN KILLER BY HOSPITAL PRE AND POST INTERVENTION

| | *Intervention hosp. Pre* | % | *Intervention hosp. Post* | % | *Control hosp. Pre* | % | *Control hosp. Post* | % |
|---|---|---|---|---|---|---|---|---|
| **NURSE** | 158 | 79 | 161 | 80.5 | 100 | 50 | 101 | 50.5 |
| **DOCTOR** | 81 | 40.4 | 90 | 45 | 121 | 60.5 | 128 | 64 |
| **ANAESTHETIST** | 18 | 9 | 19 | 9.5 | 12 | 6 | 10 | 5 |
| **CONSULTANT** | 26 | 13 | 24 | 12 | 14 | 7 | 9 | 4.5 |
| **PATIENT** | 135 | 67.5 | 137 | 68.5 | 118 | 59 | 116 | 58 |

***How satisfied were patients with the amount of pain relief they received (VAS 0-10)?***

The mean satisfaction rating for both hospitals pre and post intervention ranged between 8 and 9 with a standard deviation less than 2 (table 33).

TABLE 33 PATIENT SATISFACTION WITH PAIN RELIEF

| | *Intervention hosp. Pre* | *Intervention hosp. Post* | *Control hosp. Pre* | *Control hosp. Post* |
|---|---|---|---|---|
| **MEAN** | 8.88 | 8.77 | 8.97 | 8.98 |
| **STANDARD DEV.** | 1.23 | 1.21 | 1.58 | 1.58 |
| **RANGE** | 5.7 – 10 | 5.6 – 10 | 4.5 - 10 | 4.5 - 10 |

***How satisfied were patients with their overall pain management (VAS 0-10)?***

The mean satisfaction rating for both hospitals pre and post intervention ranged between 8 and 9 with a standard deviation less than 2 (table 34).

TABLE 34 PATIENT SATISFACTION WITH OVERALL PAIN MANAGEMENT

| | *Intervention hosp. Pre* | *Intervention hosp. Post* | *Control hosp. Pre* | *Control hosp. Post* |
|---|---|---|---|---|
| **MEAN** | 8.69 | 8.94 | 8.96 | 8.98 |
| **STANDARD DEV.** | 1.21 | 1.22 | 1.48 | 1.48 |
| **RANGE** | 5.6 – 10 | 5.7 – 10 | 4.6 - 10 | 4.5 - 10 |

**Summary Section 3 – Questionnaire Day of Discharge**

Although less than 40% of patients recalled being given information about pain prior to their surgery (15% post surgery), most felt that this was adequate. Patients in the intervention hospital were significantly less likely to have difficulty describing the nature and intensity of their pain after the intervention.

Many patients did not want more control over their pain with significantly more females than males wanting this control. Most patients were satisfied with their pain relief and pain management.

## CONCLUSION FROM QUESTIONNAIRE

Prognostic factors were comparable within and between hospitals. In general patients expected pain and had clear ideas about when they would ask for pain relief and their expectations of that pain relief. Patients suffered moderate to severe pain at stages during their post-operative recovery and many were either woken up or did not sleep due to pain. Some patients had difficulty describing their pain and many had worries about their pain and pain relief.

Patients' knowledge of pain management was poor as highlighted by many of the erroneous answers to the questions for example, 70% of patients would wait for pain to become severe to request an analgesic and 50% of patients thought that it was possible to become addicted to pain killers in hospital.

Many patients thought that the information that they had received was adequate even though less than 40% were given any information prior to their surgery and less than 15% post surgery.

Some changes are seen in the intervention hospital after the intervention. Although it did not reach significance the amount of moderate to severe pain experienced was reduced and the amount of mild or no pain experienced increased for the first 24 hours post surgery. Significantly more patients in the intervention hospital asked for pain-killers regardless of the amount of pain post intervention. These patients were significantly more likely to say that information was adequate pre and post surgery and were significantly less likely to have worries about their pain. They were also significantly less likely to have difficulty describing the nature and intensity of their pain post intervention.

## 8.3 Pain Score Analysis

*Section 1: Descriptive statistics, boxplots, line graphs, T tests*
*Section 2: Multiple linear regression*

### *Introduction*

Eight hundred patients had pain scores recorded from 8 a.m. to 8 p.m. on the day of surgery, day 1 and day 2 post surgery. The pain scores were measured on a Visual Analogue Scale (0 – 10) as described in the methodology. A total of 9138 pain scores were obtained.

Patients returned from theatre at different times during the day therefore although each pain score was measured was at the same time, this was at a different number of hours post surgery for each patient. If patients had not returned from theatre, were asleep or were discharged the pain score was marked as a missing value. Therefore time was calculated as the number of hours that each pain score was taken post surgery. Times ranged from 0 hours to 58 hours post surgery.

### Section 1 – Descriptive statistics

Time periods were divided into the five 12 hour periods post surgery:-

Period 1: 0-12 hours
Period 2: 13-24 hours
Period 3: 25-36 hours
Period 4: 37-48 hours
Period 5: 49-58 hours

The mean, median, T test results and confidence intervals are presented for the control hospital first and then the intervention hospital.

*Control hospital*

Mean pain scores within these time periods ranged from 3.6 – 5.07 as presented in figure 39 as a line graph. Figure 40 presents boxplots of the five 12 hour time points post surgery. The boxplots are based on the median, quartiles, and extreme values. The boxplots contain the 50% of values which fall between the 25th and 75th percentiles. The "whiskers" are the lines that extend from the box to the highest and lowest values, excluding outliers. The boxplots indicate that the median values ranged between 3 and 5 with the 25$^{th}$ and 75$^{th}$ percentile ranging from 2 – 7.5. The full range of the pain scores was from 0 to 10.

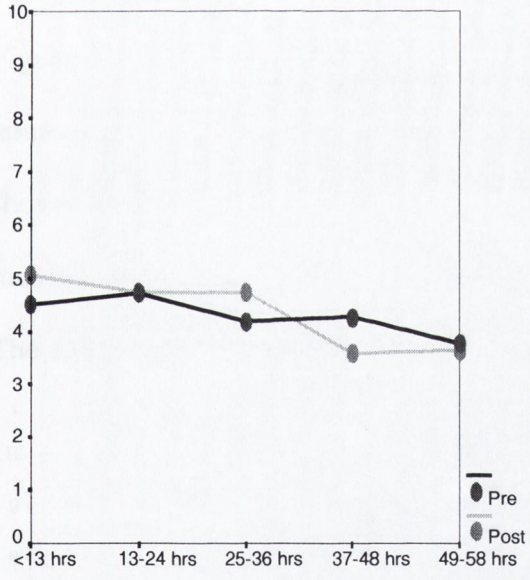


**FIGURE 39** MEAN PAIN SCORES AT FIVE 12 HOUR TIME PERIODS PRE AND POST INTERVENTION, CONTROL HOSP.

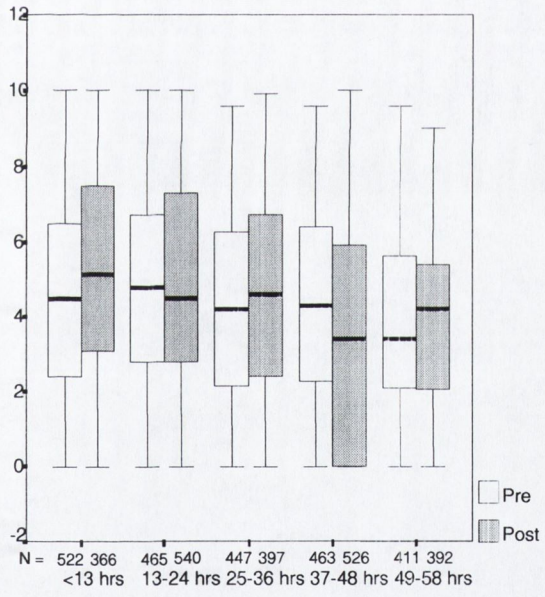


**FIGURE 40** BOXPLOTS AT FIVE 12 HOUR TIME PERIODS PRE AND POST INTERVENTION, CONTROL HOSP.

Table 35 outlines the mean, confidence intervals for the mean and t tests with p values at the five different 12-hour time periods pre and post intervention period for the control hospital. There was a significant reduction of pain scores in one 12-hour time period (37-48 hrs).

**TABLE 35** MEAN, CONFIDENCE INTERVALS FOR THE MEAN AND T TESTS WITH P VALUES AT THE FIVE DIFFERENT 12 HOUR TIME PERIODS PRE AND POST INTERVENTION PERIOD FOR THE CONTROL HOSPITAL.

| | Pre intervention | | Post intervention | | T test | P value |
|---|---|---|---|---|---|---|
| 12 hour time period | Mean | 95% Confidence interval | Mean | 95% Confidence interval | | |
| < 13 hrs | 4.52 | 4.32, 4.70 | 5.07 | 4.75, 5.38 | -2.99 | .003 |
| 13-24 hrs | 4.70 | 4.50, 4.90 | 4.75 | 4.50, 4.99 | -.10 | .924 |
| 25-36 hrs | 4.20 | 3.95, 4.43 | 4.76 | 4.49, 5.02 | -3.08 | .022 |
| 37-48 hrs | 4.28 | 4.05, 4.51 | 3.60 | 3.35, 3.84 | 3.93 | .00 |
| 48-58 hrs | 3.79 | 3.56, 4.01 | 3.65 | 3.40, 3.89 | .81 | .419 |

***Intervention hospital***

Figure 41 presents the mean of the pain scores for the intervention hospital at the five 12-hours time points post surgery pre and post intervention period as a line graph. Figure 42 shows boxplots of the five 12 hour time periods post surgery. The boxplots indicate that the median values ranged between 3 and 5 with the 25$^{th}$ and 75$^{th}$ percentile ranging from 0.5 – 7. The full range of the pain scores was from 0 to 10.

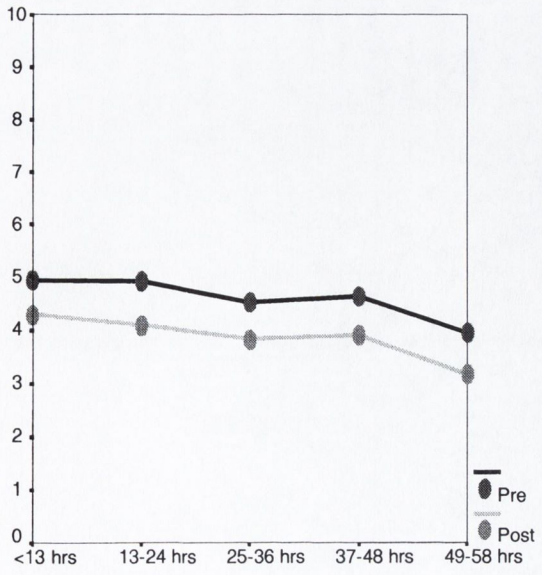


**FIGURE 41** MEAN PAIN SCORES AT FIVE 12 HOUR TIME PERIODS PRE AND POST INTERVENTION, INTERVENTION HOSP.

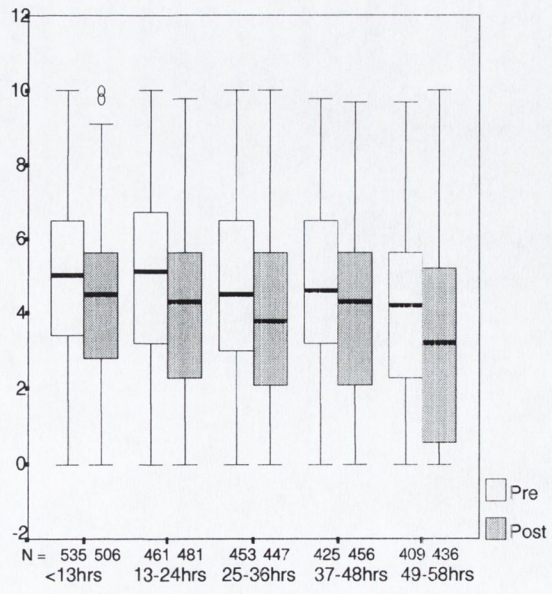


**FIGURE 42** BOXPLOTS AT FIVE 12 HOUR TIME PERIODS PREAND POST INTERVENTION, INTERVENTION HOSP.

Table 36 outlines the mean, confidence intervals for the mean and t tests with p values at the five different 12 hour time periods pre and post intervention period for the intervention hospital. There was a significant reduction in pain scores post intervention at all five time periods.

**TABLE 36** MEAN, CONFIDENCE INTERVALS FOR THE MEAN AND T TESTS WITH P VALUES AT THE FIVE DIFFERENT 12 HOUR TIME PERIODS PRE AND POST INTERVENTION PERIOD FOR THE INTERVENTION HOSPITAL.

| | Pre intervention | | Post intervention | | | |
|---|---|---|---|---|---|---|
| 12 hour time period | Mean | 95% Confidence interval | Mean | 95% Confidence interval | t | P |
| < 13 hrs | 4.95 | 4.76, 5.14 | 4.29 | 4.10, 4.48 | 4.81 | .00 |
| 13-24 hrs | 4.93 | 4.71, 5.14 | 4.09 | 3.88, 4.31 | 5.38 | .00 |
| 25-36 hrs | 4.53 | 4.30, 4.76 | 3.83 | 3.59, 4.07 | 4.16 | .00 |
| 37-48 hrs | 4.64 | 4.40, 4.87 | 3.91 | 3.68, 4.14 | 4.37 | .00 |
| 48-58 hrs | 3.96 | 3.72, 4.19 | 3.18 | 2.95, 3.40 | 4.69 | .00 |

Figures 43-46 outline the median and percentiles for pain scores at four randomly selected time points post surgery. The boxplots indicate that the median values ranged between 2.5 and 7 with the $25^{th}$ and $75^{th}$ percentile ranging from 0 – 9.5. The full range of the data were from 0 to 10.

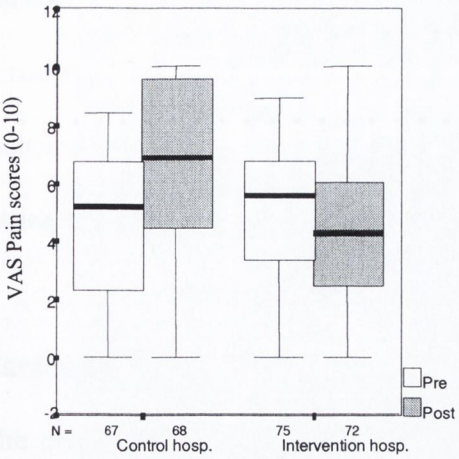


**FIGURE 43** BOXPLOT PAIN SCORES CONTROL AND INTERVENTION HOSPITALS PRE AND POST INTERVENTION AT 3 HOURS POST SURGERY

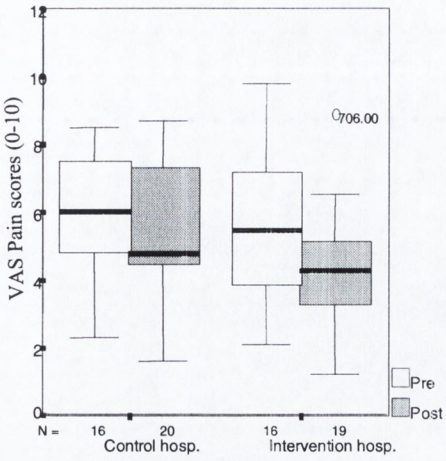


**FIGURE 44** BOXPLOT PAIN SCORES CONTROL AND INTERVENTION HOSPITALS PRE AND POST INTERVENTION AT 16 POST SURGERY

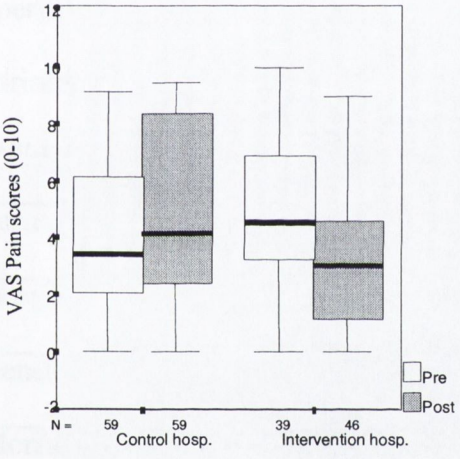


**FIGURE 45** BOXPLOT PAIN SCORES CONTROL AND INTERVENTION HOSPITALS PRE AND POST INTERVENTION AT 29 HOURS POST SURGERY

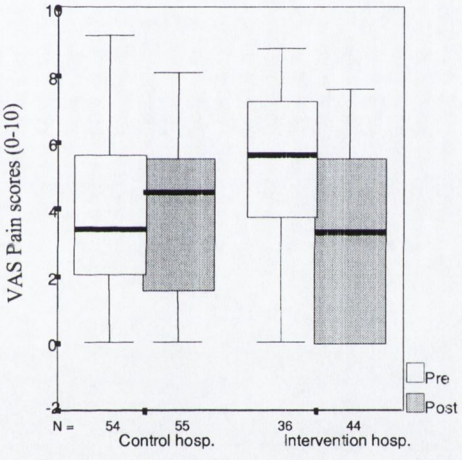


**FIGURE 46** BOXPLOT PAIN SCORES CONTROL AND INTERVENTION HOSPITALS PRE AND POST INTERVENTION AT 53 HOURS POST SURGERY

## Summary Section 1 – descriptive statistics

The median and mean for the pain scores at the five 12-hour time periods show a consistant reduction in pain scores over time for the intervention hospital post intervention. The confidence intervals for the mean are narrow indicating that these means were close to the "true" means. The t-tests show statistically significant reductions in pain scores at each 12-hour time period for the intervention hospital. The reductions in pain scores are approximately equivalent to 0.9 on the VAS scale, which is a reduction of 9% in patients' pain scores.

## Section 2 – Multiple linear regression model

A multiple linear regression model was created to reflect the relative importance of multiple factors on pain scores from the data sets from the intervention and the control hospital at various fixed time points.

### Variables included in the Multiple Regression Analysis Model

The outcome variable in this data set was the pain scores. The pain scores were entered as continuous variables directly from the data collection sheet. The explanatory variables included in the analysis were time, period, hospital, gender, morning or evening surgery, operation category and age group. The following table (table 37) identifies the categorical variables included in the model and the coding system used.

TABLE 37 CATEGORICAL VARIABLES IN THE MODEL AND CODING SYSTEM

| VARIABLE | CODE | COLUMN HEADING |
|---|---|---|
| Period | 0 = before intervention<br>1 = after intervention | Period |
| Hospital | 0 = Control hosp.<br>1 = Intervention hosp. | Hospital |
| Gender | 0 = Female<br>1 = Male | Sex |
| Morning/ Afternoon surgery | 0 = AM<br>1 = PM | AMPM |
| Operation category | 0 = Category 1<br>1 = Category 2 | OPTYPE |
| Agegroup | ≤ 30 - 0<br>31 - 60 - 1<br>61+ - 0 | Age1 |
| Age group | ≤ 30 - 0<br>31 - 60 - 0<br>61+ - 1 | Age2 |

### The Multiple Linear Regression Model

The condition that for a variable in the model to be considered statistically significant the P value should be 0.05 or less was used. Fixed time points post surgery for the regression

analysis for the pain scores were selected randomly from each 12 hour period and are presented as five sets as follows:

Set 1 - 6 hours
Set 2 - 18 hours
Set 3 - 24 hours
Set 4 - 30 hours
Set 5 - 46 hours

Each multiple regression analysis set is reported for the Intervention hospital first and then the Control hospital. The parameter estimates, standard error, t test, p value, confidence interval, $R^2$ adjusted and Analysis of Variance (ANOVA) are reported for each data set.

These tables are presented in appendix 16. The R squares adjusted in the models were low indicating that the total variation explained by the models was not very high. This meant that the models were not good predictors for the pain scores.

# Chapter 9

## Discussion and Conclusions

### Introduction

The first section of this chapter will discuss the study design and the study results drawing comparisons with the literature published. The second section will describe conclusions from the study and finally the third section will discuss the implications of the study results.


9.1 Discussion

9.1.1 Study Design

9.1.2 Study Results

9.1.3 Clinical versus statistical significance

9.1.4 Theory-practice gap

9.2 Conclusions

9.3 Implications


## 9.1 DISCUSSION

### 9.1.1 Study Design

The author hypothesised that the introduction of a nurse-led intervention would reduce patients' pain scores following surgery, thus providing a better patient service. Postoperative pain is associated with morbidity and increased hospital resources, thus reducing pain should improve patient care.[261] The study design was experimental in nature. The design, as a parallel clinical trial compared patients' pain experiences within two hospitals, a control and an intervention hospital, over time (figure 47).

Patients' pain scores and their knowledge and attitudes were measured in both hospitals at two time periods. Baseline data (phase 1) were compared to subsequent data collected after the introduction of a nurse-led intervention into the intervention hospital. The control hospital was incorporated into the design to evaluate whether temporal effects would produce changes in patients' pain experiences. If temporal effects were absent changes in patients' pain experiences in the intervention hospital could reasonably be due to the intervention.

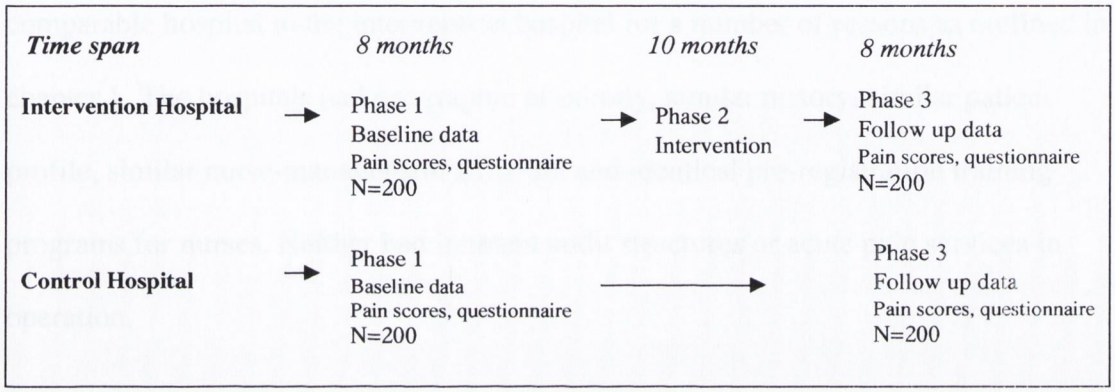


FIGURE 47 STUDY DESIGN (PARALLEL-CLINICAL TRIAL)

This type of experimental approach incorporating a control hospital to evaluate changes in patients' pain experiences following the introduction of a nurse-led intervention has not hitherto been employed in the literature published. A number of studies are published, as outlined in (appendix 2), which evaluate changes in pain scores following the implementation of an intervention(s). These are "before, after" or "pre-test, post-test" study designs which did not include control hospitals. Rose 1997[261] introduced patient strategies such as enhanced use of PCA and education for anesthetists incorporating both a control and an intervention hospital. The intervention was anaesthetic led with the primary objective of changing anesthetist's practice of pain management. Results showed successful changes in pain management practices but only modest improvements in patient outcomes; however, the authors concluded

that any changes in patient outcomes could not be attributed to the directed interventions.

The research methodology employed in this thesis is therefore unique by virtue of its experimental approach using both a control hospital and an intervention hospital to evaluate changes in patients' perceptions of pain following the introduction of a nurse-led intervention. The control hospital for this research was chosen as a suitable comparable hospital to the intervention hospital for a number of reasons as outlined in chapter 1. The hospitals had geographic proximity, similar history, similar patient profile, similar nurse-management structure and identical pre-registration training programs for nurses. Neither had inherent audit structures or acute pain services in operation.

Although the study design was experimental in nature the patient groups were not individually matched. A number of factors were deemed to be prognostic-factors, that is factors that could be considered confounding variables if statistically significantly different between or within the hospitals, thus biasing the study results. The study results show that within and between hospitals there were no statistically significant differences for these prognostic factors. These factors were operation category (major or intermediate surgery), age-group and gender of patients (tables 13, 15 and 16).

It should be noted that within hospitals both pre and post intervention there were no significant differences for operation type (i.e. orthopaedic, gynaecological, general surgery, urolological surgery). However the case-mix between hospitals was different, the control hospital performed more urology surgery than the intervention hospital,

while the intervention hospital performed more gynaecology surgery (table 1). This reflected the specialties of the hospital. This may have affected comparability of pain scores between hospitals however the strength of the study design was that intra rather than inter-hospital comparisons were employed. Thus the operation type may have influenced the pain scores but this did not compromise the study design or subsequent study results.

The intervention as described in chapter 6 used a multiplicity of approaches. These included the introduction of pain education sessions for nurses, ward information folders, regular pain assessment, profiling of acute pain management and the development and introduction of a pain policy. These sessions were two afternoons in length. Information folders placed on all surgical wards supported the pain education sessions. In-service education on post-operative pain management had hitherto not existed in the hospital. Most of the nurses attending had had no further education in pain management since their undergraduate training. They had only vague recollections of what was taught then and were very interested in revisiting the various components of the course. It would have been useful to extend the time available for these courses. This time length however allowed the majority of surgical nurses to attend. The alternative would have been a longer course length with decreased numbers attending. The author judged that in order for change to be effective it was necessary for as many nurses as possible to have had the benefit of the education sessions.

The evaluation of the intervention was via patients' pain experiences. The study design did not test for increases in nurses' knowledge. The design implies that

increases in knowledge positively affects pain management and patients' subsequent pain experience. However nurses' pain management is not only influenced by knowledge but also by individual beliefs about suffering.[9] Thus specific improvements in nurses' knowledge which may have occurred subsequent to the intervention were not quantified by this study design. At the time the author was concerned that introducing knowledge assessment before and after the educational sessions would have jeopardised co-operation with the author. Such assessment might have caused nurses to feel anxious and fearful about the changes being introduced thus reducing co-operation with the project. In retrospect it would have been interesting to have been able to quantify any changes in nurses' knowledge.

Pain assessment scores were added to the already existing vital signs sheet. Pain scores taken regularly should be available for staff to read and interpret. The strength of introducing pain scores to a pre-existing sheet increased their acceptability to staff. There was no extra documentation for subsequent filing. The pain scores themselves could be measured very quickly once understood by the patient. Thus regular recording of patients' pain did not add significantly to the busy nurses' workload but was incorporated into pre-existing work practices. Patients' vital signs are taken regularly following surgery thus asking patients about their pain at the same time was an added task, which blended easily with pre-existing routines.

The importance of introducing a stated pain policy on each ward and unit in the hospital lies in its ability to be both a mission statement and a strategy statement. A pain policy sets out the philosophy of nursing towards pain management highlighting for all staff the importance of the stated approach by the hospital to pain management. On a strategic level agreement to include pain with all other policies and procedures

ensured nursing management support for pain management strategies. This was evident in the support the author received in ensuring that nurses were encouraged to attend the education sessions by their managers.

As stated the intervention concentrated on issues such as pain assessment, education and the development and introduction of a pain policy. The author considered that the effect of the intervention would be maximised if current practices were optimised. Assessment of pain was not new for the nurses although the method was. Attending in-service education is routine although as stated this was the first time that acute pain management was revisited. Working with policies is also a day to day aspect of nursing care. The strength of introducing the interventions into pre-existing hospital "routines" increased acceptability, decreased the fear of "change" and contributed towards the continuation of these new practices following completion of the study.

The author judged that it was important to profile the importance of pain. Thus the author organised the first national acute pain conference for nurses in the Republic of Ireland during the intervention time period. It was attended by over 200-nurses nationally. Twenty-five nurses within the hospital attended representing all surgical wards in the intervention hospital. This conference profiled experts on pain both within and outside the hospital. The conference exposed nurses to methods of pain management in other hospitals and highlighted the importance of acute pain management. As part of profiling pain within the hospital the author organised a poster display on pain at the annual ward sister and staff nurses study days.

Thus the intervention employed in this experimental parallel-control trial by virtue of its multiplicity of approaches profiled acute pain management, encouraged pain assessment techniques not previously used and provided education and information for surgical nurses.

### 9.1.2 Study Results

The following section discusses the study results relating them to the relevant published research. The significance and implications of the results are highlighted. The results are discussed under the following headings:

- Patients' attitudes to pain and pain relief
    - *Information given to patients*
    - *Implications of patients' attitudes to pain and pain relief;*
- Experiences of pain;
- Patients' sleep patterns;
- Patient satisfaction;
- Nurses' role in pain management.

***Patients attitudes to pain and pain relief***

This section describes patients' expectations of pain and pain relief prior to surgery. These expectations are compared to the actual pain relief that patients experienced, the information that patients' received and the amount of control patients' perceived themselves to have over their pain management.

In common with other published work [8 100] most patients involved in the research in this thesis expected pain following their surgery (table 15). This expectation is universal to both the control and the intervention hospital. Many of these patients

(56% - 66%) expected pain to be moderate or severe (figure 16). Interestingly patients in the control hospital expected more severe and less moderate pain. However over 20% of patients in both hospitals did not know how much pain to expect (table 17).

Kuhn suggests that the standard of postoperative pain relief is poor because of inadequate education of patients' expectations, stating that the level of pain that patients' expect, is determined by any previous operative experience and information given to them preoperatively. The patients' most common informant is family and friends.[7] It is suggested in the literature that patients' expectations of pain can affect pain experiences post surgery, that patients who anticipate more pain have more positive attitudes toward taking medication and tend to take more analgesics than patients who expect to have less pain.[97]

It would appear however that many patients' pain experiences are not congruent with their expectations.[8 98] Patients involved in the research in this thesis had high expectations of their pain relief with almost 70% of patients expecting a lot or complete relief from their pain killers (figure 17). There is little difference between the two hospitals regarding these expectations both pre and post intervention. Both Owen[8] and Kuhn[7] report that most patients expect a lot of relief or complete relief from their pain medication. Paradoxically Hawkins reports that only 30% of patients get complete relief and a further 33% moderate relief from their medications.[105] This compares to Lavie's report of complete relief from injections for 31% of patients, however for many in Lavie's study pain relief lasted less than 2 hours.[98] These reports are however higher than Owen's study where 40% of patients received pain relief "some of the time" with only 8% getting complete relief from painkillers.[8] Results

from the research in this thesis are comparable where many patients did not get complete relief from their pain killers. Following surgery (figure 22) less than 20% of patients got relief from their pain-killers all of the time and less than 20%, half of the time (both the control and the intervention hospital).

Patients as well as practitioners share the responsibility for poor pain management.[15] Wilder-Smith states that patient attitudes and convictions clearly play an important role in the high failure rate of analgesic therapy. She further states that it is not known how frequently patients minimise their pain in order to avoid receiving drugs.[11] Cohen reports that only 26% of patients say that complete pain relief is the ideal goal for pain relief after surgery.[10] Many patients consider pain to be a necessary part of the healing process, believing that pain is just something that has to be endured.[94]

The results from the research in this thesis confirm patients' reluctance to request analgesia. Prior to surgery many patients (64% in the control hospital and 57% in the intervention hospital) said that they would wait until pain became severe before requesting a pain-killer (figure 18). Some of the patients stated that they would not ask for a pain-killer, waiting for pain relief to be offered and others that they would rather put up with the pain. The patients' actual actions following their surgery were however considerably different. Thirty to thirty five per cent waited until pain was severe to request analgesia and almost 30% waited to be offered a pain killer (figure 23). It is of note that significantly more patients in the intervention hospital post the multi-faceted intervention requested a pain-killer regardless of the amount of pain, $p<.05$ (table 20). There were no significant changes in the control hospital.

The literature reports the diversity of patients' attitudes to their pain control. Some patients prefer control over their pain management while others choose to remain passive in care allowing the health care team to make the decisions. Studies show that many patients wait until pain becomes severe before requesting analgesia[8], some being reluctant to ask for pain relief.[180] Lavies[98] reports that 60% of patients wait to be offered a pain-killer while Juhl[93] reports that only 64% of patients would always tell the staff if they had pain. Conversely Brydon showed that 53% of patients preferred the nurse to wait for them to say when they had pain and then to be given painkillers accordingly.[100] Hawkins reports that 79% of patients felt that they should ask for pain relief when necessary.[105]

The research in this thesis shows that 30-40% of patients (figure 37) would have liked more control over their pain relief. This compares well with Lavies who reports 35%.[98] Hawkins reports that only 30% of patients felt a high degree of control over the treatment of their pain.[105] The research in this thesis demonstrates that significantly more females than males would have liked this control ($p < .001$). This is interesting given that no studies reviewed gave information regarding gender and a relationship with control. There are no significant changes within or between hospitals before or after the intervention.

Liebeskind's and Melzack's editorial in 1987 states, that part of the problem of needless pain lies with patients who are unaware of their right to freedom from pain or who are too meek to demand it, thinking that if means were available to help them surely the people to whom they turn would know about them and use them.[1] Lisson

says that patients' means of verbalising pain may be confusing, denying pain to the nurse and physician and reporting pain to a family member.[2]

Winefield reports that 55.6% of patients felt that decisions about when they should receive more painkillers should be made by themselves, 20% by their doctor and 24.4% by a nurse.[55] Interestingly, Seers reports that 42% of patients expect the nurse to know when more analgesia is needed.[101] This thesis found that patients expected decisions on pain relief to be made primarily by the nurse and the patient, the doctor being the next decision maker (table 31). There are differences however between the control and the intervention hospital. More patients in the intervention hospital referred to nurses as key decision-makers than in the control hospital. This may have reflected a different style of nursing.

*Information given to patients*

Education of patients regarding the aims and risks of pain therapy is an essential part of pain control and can lead to an improvement in postoperative analgesia.[11] This thesis found that less than 40% of patients recalled information being given prior to surgery (figure 29) and less than 10% post surgery (figure 31). There are little differences in this recall of information between the two hospitals. Types of information that patients recalled being given were *"you might have some pain but we will look after it"*. Paradoxically over 75% of patients thought that the information was adequate.

This compares with Kuhn's report that only 57.4% of patients state that they had been given information re pain.[7] Yet Laing reports that 91% of patients indicated that they

wanted more information about the side effects of pain relieving medication and 28% wanted information about all the options available to them for pain relief.[99]

*Implications of patients' attitudes to pain and pain relief*

Most patients involved in the research in this thesis expected pain following surgery however their expectations of pain relief were high. Yet as indicated by the literature and the results from this thesis, many patients do not get a lot of relief from their pain killers and many experience prolonged periods of pain. Patients are not obtaining maximum benefit from their analgesic regimes. As highlighted by the research in this thesis many patients are receiving analgesia but less than half are getting relief from their pain killers over 50% of the time (figure 22). This has implications for the review of prescribing regimes, administration techniques and education of both staff and patients. Patient attitude and convictions play an important role in the high failure rate of analgesic therapy. Education of patients regarding the aims and risks of pain therapy is an essential part of pain control and can lead to an improvement of postoperative analgesia.[11]

Patients involved in this thesis were not aware of what their experiences of pain would be and the importance of requesting analgesia and reporting pain. Interestingly, the intervention significantly improved adequacy of information given to patients ($p<.001$) in the intervention hospital as perceived by patients. This was not seen in the control hospital. Patients' timing of requests for analgesia ($p<.05$) in the intervention hospital improved in the intervention hospital post the intervention, an improvement not evident in the control hospital.

Many prescribing regimes are "as needed" administration of analgesia. Administration trends vary and studies show that patients often receive less than the maximally prescribed dose of analgesia yet continue to be in pain.[8 80 93 178 180] Ideally patients should receive analgesia regularly avoiding peaks and troughs of pain.[173] This allows for more controlled management of their pain. McCaffrey states that patients have a right to refuse analgesia however it is important that this decision is not based on inaccurate information and on unfounded fears and misconceptions.[40]

The results from this thesis demonstrate that many patients would like more control over their management but would still like to refer to both the nurse and the doctor. The results also show that some patients do not want this control and are happy to remain passive recipients of care. The diversity of patients' attitudes towards pain management makes pain management a more complex task.

***Experiences of pain***

This section describes patients' experiences of pain following their surgery. Patients' experiences are described firstly from the questionnaire results and secondly from the analysis of the pain scores recorded following surgery.

According to several researchers, patients suffer moderate to severe pain following their surgery.[7 8 9 10 11] The results from the questionnaire used in this thesis show that for the first 24 hours following surgery less than 10% of patients had severe pain, 40-45% had moderate pain and up to 50% mild pain (figure 20). There is little difference between the two hospitals (<7%). Owen[8] reports higher levels of pain at 24 hours post surgery, with 28% having severe pain.

It is evident from the pain score analysis from the patients involved in this thesis that almost all patients experienced pain. Worst pain score in the first 24 hours post surgery ranged from 0 to 10 with a median from 6.5 to 8.5 (figure 28). No patients had difficulty using the VAS scale. For the purposes of analysis pain scores were grouped into the first five 12-hour time periods post surgery. There were statistically significant reductions in mean pain scores ($p<.05$) for the intervention hospital post intervention (table 35) for each of these five time periods. This compared to one significant reduction at one time period in the control hospital (table 34). Confidence intervals for the pain scores are narrow indicating that the pain scores were close to the "true" pain scores. These important results show the value of the intervention. They highlight the significant changes in the patients' pain experiences in the intervention hospital which were not evident in the control hospital.

The reduction of pain was in the order of 0.9 on a 0 to 10 VAS scale. This can be interpreted as a 9% reduction in the overall mean pain score of patients for the first 58 hours following surgery. A reduction of this order could be considered to have clinical relevance. Thus, the results demonstrate that a nurse-led intervention had a positive influence on patients' pain experiences.

*Pain description and assessment*

The literature highlights the fact that formal pain assessment, such as the use of a pain score or pain chart does not appear to be regular practice for nurses.[85 86 87] Yet the difficulties that patients have in communicating their pain has been documented.[65 66] Results from the research in this thesis show that up to 30% of patients had difficulty describing the nature and intensity of their pain (figure 35 – 36), which was universal to both hospitals. Almost all patients felt that their pain was believed (table 25) by the health-care team.

Accurate pain assessment is essential for judging the status and progress of patients, the impact and efficacy of treatments and sometimes for reaching a proper diagnosis.[58] Current assessment and the recording of pain by nurses has been shown to be incomplete, inaccurate (often underestimated) and to describe location rather than severity of pain.[59 60 61 62] Patients in the intervention hospital in this thesis were significantly less likely to have difficulty describing the nature and intensity of their pain post the intervention (table 27 – 28) ($p<.01$). There were no significant changes in the control hospital. It can be concluded that the introduction of regular pain score assessment by nurses following surgery in the intervention hospital provided this improvement.

*Patients' sleep patterns*

Many of the patients in this thesis had their sleep pattern interrupted due to pain. Twenty two to forty per cent of patients were prevented from sleeping with up to 50% woken up by pain (figures 24-25). Fewer patients in the intervention hospital were either woken up or had their sleep disturbed post intervention. This did not however

reach statistical significance. Cohen however reports 73% of patients with sleep disturbed by pain.[10] The importance of sleep is emphasised as part of the cycle of pain. Kreitzer states that psychological effects such as anxiety, fear, helplessness and sleep deprivation alter the response to pain.[146]

***Addiction to Pain Killers***

The results from the research in this thesis show that almost 50% of patients thought that it was possible to become addicted to pain killers while in hospital (figure 38). This was found in both hospitals and is much higher than other reports in the literature. Lavies reports 33%.[98] Laing says that patients overestimate the risk of addiction though does not quantify this.[99] The chances of becoming addicted is cited as less than 1%.[124] However patients have fears of addiction and this may prevent them taking medications. Wilder-Smith states that 17.5% patients in her study who preferred not to be given pain medication were frightened of drug addiction.[11] Landers stresses that fallacious belief about addiction liability of narcotics may be the root of under-management of pain.[123] In the literature nurses overestimate the likelihood of addiction.[123 124] It would appear that patient fallacies are being compounded by nurse fallacies.

***Patient Satisfaction with Pain Management***

The results from the research in this thesis show that satisfaction with overall pain management and pain relief was very high (table 32-33) in spite of high levels of pain at many stages post surgery (figures 39-42). This satisfaction was found in both the control and the intervention hospital. There were no significant changes following the intervention but this should be viewed in the context of low patient expectation. In

1977 Hunt et al stated that patients' expectations are low, as indicated by unanimous praise for both doctors and nurses.[130] Many studies agree that patients continue to report high satisfaction with pain management in spite of high levels of pain.[9 98 288 289 290] Pellino states that the factors that account for patient satisfaction with acute pain management remain a mystery. Following a study of 137 patients she reports that it is the interpretation or perception of having control over the pain that most relates to satisfaction with pain relief.[291] Ward postulates that patients are satisfied even though they are in pain because they experience a commonly-expected peak and trough pattern of pain relief, a pattern that occurs with "as needed" medication.[292] Bostrum says that patients may express satisfaction because they do not have sufficient knowledge of pain relief and that patients often judge the kindness of staff rather than their way of treating pain.[293] Jamison reports that patients who perceived that doctors and nurses showed concern with how much pain they were feeling reported greatest satisfaction with their care.[290]

Scott and Hodson state that the public has a high degree of confidence in the ability of doctors and nurses to treat pain.[57] Thus, enhancing patient satisfaction may be difficult given that satisfaction is currently rated highly. Hence patient satisfaction as an indicator of quality of patient care may not be appropriate. The usefulness of the patient satisfaction measurement is nullified for this reason as well as the ambiguity evident in the literature as to what satisfaction is actually measuring.

***Nurses' role in pain management***

Over the past 2000 years knowledge and beliefs about pain have changed dramatically in some ways and not at all in others. Donovan describes six general stages of

evolution: from pain as punishment, pain as a warning, pain as emotion, pain as neurotransmission, pain as a challenge to science to pain as a complex phenomenon.[9] Modern medicine may have brought new understanding and improved technology but even without new techniques postoperative pain management can be improved through an understanding and application of basic pain management principles.[175] Pain is an expected outcome of surgical procedures. The perception of pain is a function of the nervous system. Nurses by their responsibility for the provision of measures to relieve pain must interpret this pain in order to manage it appropriately. Interpretation of pain is via pain assessment methods, which rely on patients' self report and professional judgement. The nurse in her role identifies the need for changes in methods of pain relief, assesses the impact of pain relief and communicates the findings to the multi-disciplinary team.[114]

This study demonstrates the positive effect that a nurse-led intervention had on patients' pain experiences. This nurse-led intervention was based on the application of basic pain management principles. Results from the research in this thesis, in corroboration with information from the literature,[113] highlight the important role of the nurse in pain management. The nurse's role is vital in the chain of pain management. He/ she interprets pain, administers and evaluates pain management procedures, provides information to patients and works as a member of the multidisciplinary team. Certain skills and knowledge are needed in order that the nurse can embrace effectively this role in pain management. On-going strategic in-service education is necessary keep nurses updated. Studies highlight nurses' lack of knowledge and the disparity between nurses' and patients' perceptions of pain.[3 115 116]

Table 38 details facets of the nurse's role in acute pain management. These facets relate to information giving, assessment of pain, administration of analgesia, monitoring effectiveness of analgesia, documentation of pain, team work, alternative approaches to pain management, holistic approach to patient care and evaluation of service. The knowledge and skills required by nurses to manage pain are outlined. Use of the table by matching knowledge and skill to role facet provides guidelines on how nurses can perform an effective role in pain management by applying basic pain management principles.

**TABLE 38** FACETS OF NURSES' ROLE IN PAIN MANAGEMENT

| ROLE FACET | KNOWLEDGE | SKILLS |
|---|---|---|
| Information giving to patients<br>➢ Methods of pain relief<br>➢ Assessment of pain<br>➢ The roles and functions of the health-care team in pain mangement<br>➢ Role of the patient | • Pain relief methods<br>• Pain assessment methods | • Effective communication skills |
| Assessment of pain<br>➢ Verbal assessment<br>➢ Non-verbal assessment | • Knowledge of assessment tools<br>• Knowledge of pain physiology | • Ability to use assessment tools reliably<br>• Ability to interpret non-verbal cues of pain |
| Administration of analgesia<br>➢ Opioids<br>➢ NSAIDs | • Knowledge of analgesic drugs (action, time of effect, side-effects) | • Ability to administer by many routes<br>• Ability to use administration pumps e.g. PCA |
| Monitoring effectiveness of analgesia and adverse effects<br>➢ Opioids<br>➢ NSAIDs | • Knowledge of analgesic drugs (action, time of effect, side-effects) | • Ability to integrate theory with practice |
| Documentation of pain | • Knowledge of documentation criteria | • Ability to write clearly and concisely |
| Team work | • Ability to identify relevant issues to report<br>• Ability to work within a team | • Effective communication skills |
| Alternative approaches to pain management | • Other approaches to pain relief e.g. relaxation, cold, heat, distraction | • Competency in alternative approaches to pain management |
| Holistic approach to patient care | • Knowledge of pain management<br>• Knowledge of integrated approach to care | • Ability to manage patient as a service user and as a member of a wider community |
| Evaluation of service | • Clinical Audit | • Ability to use results of clinical audit to evaluate nurses' contribution to pain management. |

### 9.1.3 Clinical versus statistical significance

This sections aims to discuss the clinical versus the statistical significance of the results in this thesis. The research in this thesis demonstrated that the introduction of a nurse-led intervention reduced patients' pain scores. This reduction, in the order of .9 (9%) on a visual analogue scale (0-10) was statistically significant for the first five twelve-hour time periods post surgery (<.001).

Altman says that the aim of statistics is to improve the reliability and credibility of findings from research.[294] However he says that it is common practice to take a statistically significant result as a real effect and often, by its implication as a clinically important one. Neither interpretation he says is necessarily true.[295] Statistical significance refers to whether an observed difference is more likely than a real difference rather than a chance occurrence. Clinical significance on the other hand relates to the question of importance or potential importance of a finding to the clinical population.[296] Statistical significance does not necessarily equal clinical importance. [297]

Since there is no universal definition of clinical significance the judgements, opinions and behaviour of subjects in addition to observation of key individuals should be the primary evidence confirming clinical significance.[296] Rethman and Nunn[298] argue that the individual clinical context is the key determinant for relevancy. They suggest that a claim of clinical insignificance of a statistically significant result depends on a critical assessment of the sometimes unique context in which a clinical decision must endure. Contextual considerations ought to be more widely and thoughtfully considered in both the design and clinical interpretation of the studies. Clinicians

should remember that there are several contextual criteria relevant to the myriad circumstances of everyday practice. Relative cost and morbidity are only two. Each clinician must make a determination of clinical significance based on the individual context in which he/ she hopes to apply the information to benefit the patients.

Measurement of pain, due to the absence of objective measurement, relies on the patient's self report. Pain measurement is one of the oldest and most studied of the subjective measures and pain scales have been used for over 40 years. Pain measurements are remarkably sensitive, and consistent results can be obtained.[299] The visual analogue scale has been cited as the most sensitive method for measuring pain.[69 72 78 80] The VAS is reported to assess more closely what a patient actually experiences with respect to changes in pain intensities.[79] Philip[300] states that VAS data are most appropriately analysed by parametric techniques. These techniques permit statistical inferences without altering the risk of type I and type II errors, whereas use of nonparametric techniques may increase the likelihood of type II errors.

Therefore the use of a VAS which is recognised as sensitive and consistent and the analysis of the scale with parametric techniques increases the likelihood of the results from this thesis being a true representation of patients' pain experiences. However Todd[301] highlights that the question of clinical significance has not been addressed in the assessment of pain relief. He argues as to who should determine the clinical meaning of differences in pain experience, whether it should be the patient, the health profession or society.

The results in this thesis demonstrate reductions in pain scores in the order of 9% for patients in the intervention hospital. Given that there is no gold standard outlined in the literature stating as to what is clinically important for acute pain management the difficulty then is to determine the degree of clinical importance of these results. The study results demonstrate a consistent reduction in patients' pain scores in the intervention hospital post the intervention. This reduction had statistical significance. The method of pain assessment used in this study, the VAS, has been shown to be a sensitive, valid and reliable method of pain assessment and the method of analysis was appropriate. It is reasonable to assume that the VAS score reductions are thus directly related to patients' actual experiences of pain. Studies[132] highlight that the goal of pain management should be to minimise discomfort and to strive for freedom from pain for the patient[1]. There is no gold standard in the literature to demonstrate what exact reductions are necessary to show clinical relevance however the reductions themselves (in the order of 9%) demonstrate a significant movement towards reducing patients' acute pain post surgery.

It has been shown that society experiences unnecessary acute pain while in hospital.[7 8 9] The clinical importance of this study for the patient as part of society is that their pain was consistently less. For nurses as a profession this study demonstrates that nurses can positively affect the patient's pain experience by reducing their pain scores. It can be inferred thus that this study, by demonstrating a reduction in pain scores for patients, as such has clinical relevance.

### 9.1.4 Theory-practice gap

It has been recognised for over fifty years that a theory practice gap exists in nursing.[302] Castledine[303] suggests that the gap is an international problem and not limited to particular practice settings. Much has been written about this gap, that is the discrepancy between what is taught in the educational setting and how care is actually delivered in practice. However, the transfer of knowledge to practice or utilisation is not unique to nursing. For example, the time lag between the discovery of citrus juice as a preventative measure for scurvy and in its use on British ships was 264 years.[304] Conant in 1967 describing the practice-theory gap said that prediction is not enough in nursing, we must be able to prescribe, to specify and carry out planned activity that will change the natural outcome to the desired outcome.[305] This requires transfer of scientific knowledge to a particular practice setting.

Without doubt the theory-practice gap exists within acute pain management. The continued levels of unacceptable acute pain documented consistently from the 1950's confirm the reality of the theory-practice gap for acute pain management.[7 8 9 10 11 12 13 14] It is suggested in the literature that the problem with under-management of acute pain lies not so much in finding new strategies to manage pain but in having health care professionals utilise available scientific knowledge in their daily practice.[15] This suggests that if the theory was transferred to practice the acute pain experience of the patient would be improved. It may be that much of the time and resources that have been spent seeking "answers" for acute pain management (searching for new drugs, new methods of administration) may have been more wisely spent on looking for methods of reducing the theory-practice gap.

The literature outlines many reasons why the gap exists. It is suggested that the gap may be due to the different approach or emphasis that educationalists and service practitioners take to teaching students, the former attempting to foster self-directed learning, the latter to produce safe practitioners.[306] The gap may exist due to a crucial divide, which may be the absence of a definition of nursing.[307] Allmark[308] perceives the problem of the theory-practice gap is that it is built on the assumption that theory can and must be applied directly to nursing practice. Upton[309] (1999) states that theory and practice are not exclusive, single entities but are in fact inseparable. Upton highlights four pillars of nursing; management, practice, research and education. She asks the question: how can evidence based practice be achieved when fundamental inconsistencies exist within these four pillars? Other arguments conclude that the theory-practice gap can never be sealed entirely; that theory and practice are by their nature always in a dynamic tension, and that this tension is essential for change in clinical practice to occur. [310]

Lindsey[311] however believes that the gap should be viewed in a positive light, stating that theory does not equal practice because theory is constantly setting new goals for practice by the development of new concepts and ideas intended for improvement of care. Using this positive view, theorists and practitioners are interchangeable, working together to bridge the divide between ideals and reality to expand and improve nursing care for the benefit of patients and carers alike.

Kim describes the process of application of theory to practice as four steps with an overlap of knowledge in public domain and knowledge in private domain. The four steps are described as practitioner's perception of situation, practitioner's framing of

situation, choice of intervention theories and strategies and lastly enactment of nursing interventions. [312]

#### *9.1.4.1 Theory-practice gap and Roger's theory*[313]

The methods employed in this thesis which demonstrate the significant reduction of patient's pain scores in the intervention hospital could infer a method of reducing the theory-practice gap in acute pain management. The methods used to introduce the intervention in this thesis will be discussed with reference to Roger's[313] knowledge diffusion and utilisation theory. Rogers describes diffusion as the process by which an innovation is communicated through certain channels over time among members of a social system. The four main elements of diffusion are firstly, the innovation, secondly, communication channels, thirdly, time and fourthly the social system.

##### *1. Innovation*

An innovation is described by Rogers as an idea, practice or object that is perceived as new by an individual or other unit of adoption. The intervention employed in this thesis could be considered as the innovation. The intervention as described in chapter 6 used a multiplicity of approaches. These included the introduction of pain education sessions for nurses, ward information folders, regular pain assessment, profiling of acute pain management and the development and introduction of a pain policy.

Rogers outlines four characteristics of the innovation, which help explain the rate of adoption of the innovation. These characteristics are relative advantage, compatibility, degree of complexity and trialability.

*Relative advantage*

Relative advantage is described as the degree to which an innovation is considered to be better than the idea it supersedes, in other words the current practice. In this thesis the author judged that it was important to profile acute pain management. Thus the author organised the first national acute pain conference for nurses in the Republic of Ireland during the intervention time period (this was attended by over 200-nurses nationally). This conference profiled experts on pain both within and outside the hospital. The conference exposed nurses to methods of pain management used in other hospitals and highlighted the importance of acute pain management. As part of profiling pain within the hospital the author organised a poster display on pain at the annual ward sister and staff nurse's study days. Nurses may have perceived advantages related to the use of regular pain assessment as part of the recording of the patient's vital signs. These advantages may have been the provision of an objective record of the patient's pain history, easily documented, which would allow for evaluation of the effectiveness of the various pain strategies.

*Compatibility*

Compatibility is the degree to which the innovation is perceived to be consistent with current values, past experience and the needs of potential adopters. An idea that is not compatible with the prevalent values and norms of a social system will not be adopted as rapidly as an innovation that is compatible. Pain assessment scores were added to

the already existing vital signs sheet. Pain scores taken regularly as part of best practice in acute pain management should be available for staff to read and interpret. The strength of introducing pain scores to a pre-existing sheet increased their acceptability to staff. There was no extra documentation for subsequent filing. The pain scores themselves could be measured very quickly once understood by the patient. Thus regular recording of patients' pain did not add significantly to the busy nurses' workload but was incorporated into pre-existing work practices. Patients' vital signs are taken regularly following surgery thus asking patients about their pain at the same time was an added task, which blended easily with pre-existing routines.

As stated the intervention concentrated on issues such as pain assessment, education and the development and introduction of a pain policy. The author considered that the effect of the intervention would be maximised if current practices were optimised. Assessment of pain was not new for the nurses although the method was. Attending in-service education is routine although as stated this was the first time that acute pain management was revisited. Working with policies is also a day to day aspect of nursing care. The strength of introducing the interventions into pre-existing hospital "routines" increased acceptability, decreased the fear of "change" and may have contributed towards the continuation of these new practices following completion of the study.

*Complexity*

Complexity is the degree to which the innovation is perceived to be difficult to understand or use. If the innovation requires the development of skills, complexity increases. The intervention in this thesis did involve the nurses having to increase

their base-line knowledge, which may have affected the complexity of the innovation. However the nurses were entering the education sessions from a base of clinical experience and some theoretical background albeit it in the distant past. The method of pain assessment was new which again challenged the nurses; however, the nurses were already assessing pain even though it not in a formal manner.

*Trialability*

Trialability is the extent to which an innovation can be experimented with on a limited basis. Thus new ideas that can be tried on a limited or short-term basis with the option of returning to previous practices increases the trialability of the innovation. Although the nurses were encouraged to adopt the practices and supported to do so there was no forcing of ideas. The author who introduced the intervention was in the position of nurse researcher in the hospital with a special interest in surgical pain management. Thus from a management point of view the researcher could only suggest and recommend changes to current pain management strategies.

***2. Communication channels***

The second element of diffusion relates to communication channels. Communication of the intervention in this study was via the education sessions. In-service education on post-operative pain management had hitherto not existed in the hospital. Most of the nurses attending had had no further education in pain management since their undergraduate training. They had only vague recollections of what was taught then and were very interested in revisiting the various components of the course. It would have been useful to have extended the time available for these courses. This time length however allowed the majority of surgical nurses to attend. The alternative

would have been a longer course length with decreased numbers attending. The author judged that in order for change to be effective it was necessary for as many nurses as possible to have had the benefit of the education sessions. Thus communication of changes in pain management was not limited to a few nurses but was widespread to the surgical wards.

*3. Time*

The third element of diffusion relates to time. There are three time periods of interest described in understanding diffusion-adoption. Firstly, the time span from the point at which an individual first hears about an innovation to the point at which a decision is made to accept or reject the innovation. Secondly, the innovativeness of the individual/ agency that determines the time needed to achieve adoption and thirdly, the number of individuals within a social system who adopt an innovation within a given time period. The decision-making time period has been conceptualised by Rogers as consisting of five steps: knowledge as the first awareness of the existence of the innovation, persuasion occurs when the individual chooses to adopt or reject the innovation, decision occurs when the individual chooses to adopt or reject the innovation, implementation occurs when the individual uses the innovation and lastly confirmation occurs when the individual seeks reinforcement of the decision. During the knowledge stage, communication can occur through mass media. However through the rest of the stages interpersonal networks with near peers are much more likely to influence the individual. Although the author of this thesis did not measure the support time given to the nurses, the time spent encouraging and supporting pain assessment and management at ward level may have influenced the persuasion stages.

*4. Social system*

The fourth element of diffusion relates to the social system. Rogers considers a social system as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. Thus the diffusion of the innovation will be affected by the social structure of the system. A social system has both formal and informal structure. Formal structure is related to authority and power. Informal structure is related to who interacts with whom under what circumstances. In this thesis the importance of introducing a stated pain policy on each ward and unit in the hospital lay in its ability to be both a mission statement and a strategy statement. A pain policy sets out the philosophy of nursing towards pain management, highlighting for all staff the importance of the stated approach by the hospital to pain management. On a strategic level, agreement including pain with all other policies and procedures ensured nursing management support for pain management strategies. This was evident in the support the author received in ensuring that nurses were encouraged to attend the education sessions by their managers. This may have been how the formal structure of the social system adopted the innovation. On an informal level the author involved nurses, ward sisters and nurse tutors in the development and delivery of the education program, many of whom contributed to the poster displays at the ward sister and nurse's study days. This may have influenced the informal system in that the personnel involved may have given credence and support to the innovation, which is not directly measurable.

### *9.14.2 Reduction of theory-practice gap*

The author, by using the approaches described above, contributed towards reducing the theory-practice gap in acute pain management in the intervention hospital. The author hypothesised that the introduction of a nurse-led intervention would reduce patients' pain scores following surgery, thus providing a better patient service. The study design was experimental in nature. The design, as a parallel clinical trial compared patients' pain experiences within two hospitals, a control and an intervention hospital, over time. Patients' pain scores and their knowledge and attitudes were measured in both hospitals at two time periods. Baseline data (phase 1) were compared to subsequent data collected after the introduction of a nurse-led intervention into the intervention hospital. The control hospital was incorporated into the design to evaluate whether temporal effects would produce changes in patients' pain experiences. If temporal effects were absent changes in patients' pain experiences in the intervention hospital could reasonably be due to the intervention. The research demonstrated that the introduction of a number of a nurse-led intervention reduced patients' pain scores. This reduction, in the order of .9 (9%) on a visual analogue scale (0-10) was statistically significant for the first five twelve-hour time periods post surgery ($p<.001$). This reduction was not seen in the control hospital. This is an overall reduction of 9% in the patients' mean pain scores for the first 58 hours following surgery and, as such, has clinical relevance.

The intervention significantly improved patients' description of both the intensity and the nature of the patients' pain ($p<.05$) in the intervention hospital. These significant improvements were not seen in the control hospital. Patients' timing of requests for analgesia significantly improved ($p<.05$) following the intervention in the intervention

hospital. This improvement was not evident in the control hospital. The intervention significantly improved adequacy of information given to patients ($p<.001$) in the intervention hospital as perceived by patients. Again, this was not seen in the control hospital.

These results show that patients' pain experiences were positively affected in the intervention hospital by the intervention. The use of a parallel clinical trial to show this reduction confirms that theory was implemented into practice. However, of interest in this study design, was that the intervention not only provided theory but also put structures in place to follow through theory at both a clinical and a management level. At clinical level a mechanism of recording pain as it was taught was made available (pain assessment scores at the end of vital signs sheets). A pain policy was available at ward level and further pain information was supplied in the form of an information folder. The profile of surgical pain was raised within the hospital (pain conference, posters, policy), which may have made it more acceptable for nurses to change practice. The acceptance of a pain policy and the encouragement of staff to attend the education sessions by management demonstrated their support. The author thus created a situation where firstly nurses were given the theory, secondly, changes in pain management strategies were perceived as important both by the practitioner and by management and thirdly, the facility for change was created at ward level.

The author therefore suggests that a model (see figure below) which does not view the theory practice gap as a linear relationship may provide a key to reducing the theory practice gap in acute, surgical pain management by nurses. This model proposes the

necessity for inclusion of both social, clinical and management support for acute pain theory in order for the theory-practice gap to be reduced significantly so that patients' experiences of pain will be positively affected.

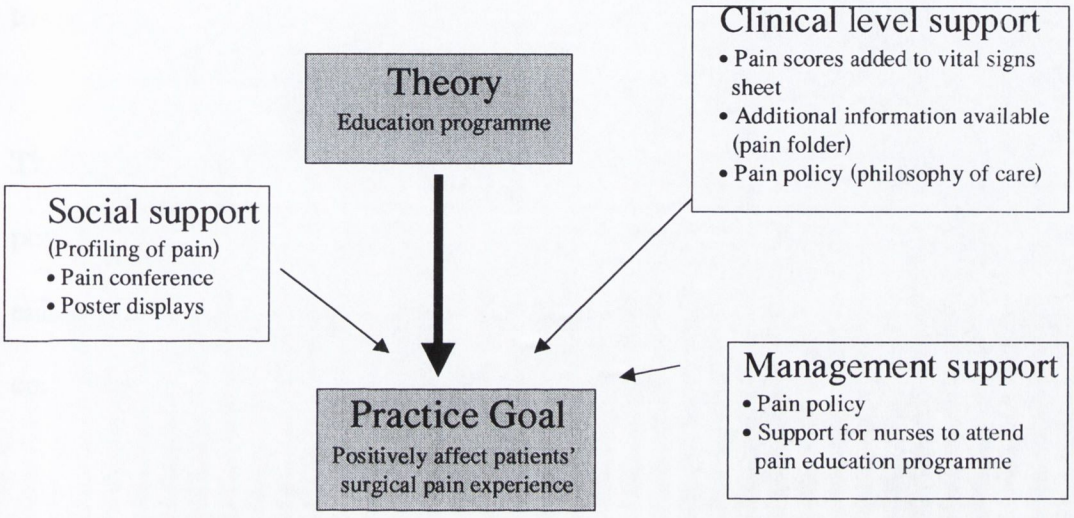


FIGURE 48 THEORY-PRACTICE GAP – A MODEL

Social support allows the theory to be seen as a "good" thing by nurses. In this study acute pain management was seen as a positive goal. Management support ensured the availability of both resources and a positive attitude to the nurses. At ward level, providing the mechanism for change ensured the feasibility of putting change into practice (changes in modes of pain assessment). This all round support for theory allowed practice to change so that patient's surgical pain experience was positively affected.

This model proposes a method of reducing the theory-practice gap, which has not hitherto been discussed in relation to nursing practice. The principles of the model are adopted firstly, with reference to both the pain and the clinical decision making

literature, and secondly, with reference to the diffusion-innovation theory. The uniqueness of this proposed model is that it views both the theory and practice in context. The model does not exclude the current methods of providing theory or the current methods of providing care. The model is inclusive of the organisational, day-to-day culture within which both nurses and educationalists work.

The research from this thesis has shown an improvement in the care patients receive post surgery. The model suggests that the application of theory to practice can be enhanced by consideration of firstly the practice goal and secondly by review of the contemporary clinical, management and social supports.

## 9.2 CONCLUSIONS FROM THE RESEARCH IN THIS THESIS

The results from the research in this thesis show that improvements in pain management for patients can be achieved through better utilisation of nursing staff and nursing skills. This research demonstrates that the introduction of a nurse-led intervention positively affected patients' pain experiences following surgery in a number of ways. Significant changes were seen in the intervention hospital which were not evident in the control hospital.

The research demonstrated that the introduction of a number of a nurse-led intervention reduced patients' pain scores. This reduction, in the order of .9 (9%) on a visual analogue scale (0-10) was statistically significant for the first five twelve-hour time periods post surgery ($p<.001$). This reduction was not seen in the control

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The intervention significantly improved patients' description of both the intensity and the nature of the patients' pain ($p<.05$) in the intervention hospital. These significant improvements were not seen in the control hospital.

Patients' timing of requests for analgesia significantly improved ($p<.05$) following the intervention in the intervention hospital. This improvement was not evident in the control hospital.

The intervention significantly improved adequacy of information given to patients ($p<.001$) in the intervention hospital as perceived by patients. Again, this was not seen in the control hospital.

The study provides new knowledge relating to pain management post surgery. It demonstrated that the introduction of a nurse-led intervention significantly reduced patients' pain scores in the order of 9%. This reduction has clinical relevance.

## 9.3 IMPLICATIONS FROM THE RESEARCH IN THIS THESIS

Conclusions from this study have implications particularly for nurses but also for hospital management, for university departments and for health policy. The following section discusses the implications of this study.

*Implications for nurses*

Lutz states that, for most patients, postoperative pain can be prevented or diminished and clinicians should be aware of the available techniques for achieving this goal. Responsibility for pain management lies with all of the health care team: nurse, doctor, anaesthetist, physiotherapist and the patient himself.[46] Gould states that key features in acute pain services are a multidisciplinary team working together and that Nurses by actively contributing to the multidisciplinary team can influence quality of patient care.[187]

The research in this thesis highlights for nurses the inadequacy of patient knowledge regarding pain and pain management. Nurses have an important role to play in the quality of information given to patients and they need to embrace this role. Difficulties that patients have describing their pain are evident from the research in this thesis and from the literature.[65 66] The routine use of a pain assessment tool by nurses can help eliminate patient difficulties in describing pain.[18] Pain scores recorded regularly can be used as an audit tool to evaluate the effectiveness of pain management. Such audits can contribute to overall hospital quality-assurance programs. Health care providers should view good pain control as a major responsibility in the provision of quality patient care.[172]

The research in this thesis highlights the fact that current pain management regimes are not serving the patient as well as they might. The high pain scores that patients suffered confirm the failure of current prescribing regimes. There is merit in reviewing these regimes given that the literature implies that much "prn" prescribing is in contrary to best practice, which states that analgesia should be given regularly. [8 91]

[93] Although nurses do not prescribe they are the principle administrators of analgesia. Therefore poor prescribing regimes are being compounded by poor administration patterns. Nurses have a key role to play in the assessment and evaluation of such regimes. In turn, their report of the effectiveness of regimes influences prescribing.

***Implications for hospital management***

Pain initiatives have staff and resource implications but economic justification can be found in the reduced morbidity, faster convalescence and improved satisfaction in patients who receive adequate relief of postoperative pain.[132] Some authors indicate that good pain management reduces length of stay in hospital.[47 49]

The research in this thesis highlights the amount of pain that patients continue to suffer in hospital (figures 39-42). Hospital management by their concern should use quality assurance procedures periodically to assure that best practice in pain management is being carried out.[134] Data from such surveys has been found to be helpful in setting targets for improving care.[14] Studies highlight that it is not only the use of high tech equipment that improves pain management but that simple techniques of regular pain assessment and the more frequent use of intramuscular analgesia can be particularly effective.[187]

Results from this thesis imply that pain management can be improved for patients by the introduction of a nurse-led intervention. Hospital management should endorse strategic planning of pain management. In line with the Irish Patient's charter[108] management has an obligation to ensure that patients receive appropriate information. The research in this thesis shows that patients receive little information either before

or after surgery and that the information that they do receive is not specific enough to improve pain management.

*Implications for Universities*

Chapman suggested that the aim of post operative pain management needs to be more strongly defined in nurse education.[126] Education and training of many health care professionals, including nursing staff, does not place enough emphasis on contemporary methods of pain assessment and management.[64] With the movement of Irish nursing education into university settings it is timely that the research from this thesis highlights nursing educational needs in relation to pain management. Pain management cannot be effective if its implementation is based on inadequate knowledge and erroneous beliefs. Brunier showed that nurses with a university education scored significantly higher in a knowledge and attitude survey. She also demonstrated that nurses who had attended educational sessions on pain management within the last year scored significantly higher.[3] Both Lloyd[127] and Watt-Watson[121] endorse the need for focused education programs in pain management.

Undergraduate courses need to highlight the importance of pain management and treat pain management as a holistic module. Post-graduate courses should include a pain module, while advanced clinical practice courses should include pain management as a specialty.

The research from this thesis proposes a model for reduction of the theory-practice gap in acute pain management. This model proposes the necessity for inclusion of both social, clinical and management support for acute pain theory in order for the

theory-practice gap to be reduced significantly so that patients' experiences of pain will be positively affected. This model emphasises the important of collaboration between educationalists, hospital management and clinicians. This partnership approach could contribute towards matching the theory goals with the practice goals.

***Implications for Health Policy***

In 1988 Ready et al drew attention to the potential role of an acute pain service (APS).[182] Eight years on, Windsor reports that in the United Kingdom 42.7% of hospitals had a multidisciplinary acute pain service in place by 1994.[90] In 1998 Harmer reported on the effect of education, assessment and a standardised prescription on postoperative pain management following a clinical audit of 15 hospitals in the United Kingdom. He reported that following the introduction of the above there was an overall reduction from 32% to 12% in the percentage of patients who experienced moderate to severe pain at rest. The incidence of severe pain on movement decreased from 37% to 13% and moderate to severe pain on deep inspiration from 41% to 22%[192] Thus the literature indicates that the advent of Acute Pain Teams/ Services improves the pain management offered to patients. [185 187 190 191 192]

However a major European survey[314] of acute pain services in Europe shows that 64% of European hospitals have no organized acute pain services. Interestingly, 80% of the Irish anesthetists who completed the survey were dissatisfied with the pain management on surgical wards. This compares to 55% of all European anesthetists. Economic and administrative problems were named as the reasons for inability to provide the analgesic treatment of choice.

The results from this thesis show that patients are suffering moderate to severe pain. The potential to improve pain management is evident in the literature and from the results from this thesis. The corroboration of the evidence from this study with published literature implies that the pain experiences from the two hospitals in this study are not unique in Ireland. Thus the study results has national implications.

A health policy document setting out best practice in pain management would empower both the recipients of care and the providers of care to improve current post-operative pain management.

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# APPENDICES

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*Appendix 1* *Short form McGill Pain Questionnaire*

## SHORT FORM McGILL PAIN QUESTIONNAIRE

PATIENT'S NAME:_____ DATE:_____

| | NONE | MILD | MODERATE | SEVERE |
|---|---|---|---|---|
| THROBBING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| SHOOTING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| STABBING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| SHARP | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| CRAMPING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| GNAWING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| HOT-BURNING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| ACHING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| HEAVY | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| TENDER | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| SPLITTING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| TIRING-EXHAUSTING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| SICKENING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| FEARFUL | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| PUNISHING-CRUEL | 0)_____ | 1)_____ | 2)_____ | 3)_____ |

NO PAIN |_____| WORST POSSIBLE PAIN

| | | |
|---|---|---|
| 0 | NO PAIN | _____ |
| 1 | MILD | _____ |
| 2 | DISCOMFORTING | _____ |
| 3 | DISTRESSING | _____ |
| 4 | HORRIBLE | _____ |
| 5 | EXCRUCIATING | _____ |

## *Appendix 2 Studies evaluating changes in pain scores*

TABLE 37 STUDIES EVALUATING CHANGES IN PAIN SCORES

| Reference to study | Study design[a] | Timing of data collection | Pain Score measurement |
|---|---|---|---|
| Sofaer 1983[117] | Pre and Post test study design (N=96) | Retrospective pain ratings on 3rd postoperative day for the three preceding days | Graphic rating scale |
| Gould 1992[187] | Pre (N=213) and Post[b](N= 219) test design | Three VAS scores for patients experience of pain over previous 24 hours (on relaxation, on movement and on a deep breath) at 24 hours post surgery. | Visual Analogue scale |
| Rose 1997[225] | Before (N=525) and After[c] (N=525) study design with concurrent control group (N=375) | Recorded at six hours post discharge from post-anaesthesia care unit (PACU).<br>Pain at rest and during activity and pain for the entire six hour interval was recorded. | 11 point pain scale |
| Pesut 1997[190] | Pre (N=76) and Post[d] (N=102) test design | Mean pain scores for each 24 hour time period was calculated for 48 hours.<br>Total number of pain ratings greater than 4[e]<br><br>Retrospective chart review | 10 point pain scale |
| Mackintosh 1997[185] | Pre (N=100) and Post[f] (N=106) test design | Single measure of pain between 48-72 hours post-operatively | Verbal intensity rating[g] |
| Tighe et al 1998[191] | Pre (N=806) and Post[f] (N=712) test design | Retrospective pain assessment during the first, second and third consecutive 24 hour periods after surgery | Four point verbal rating pain scale |
| Harmer 1998[192] | Pre (N=1416) and Post (N=1322) test design | Interview at 24 hours and 4 days post surgery | Four point verbal rating pain scale[h] |

a Includes sample size

b There were seven stages to the study, stage 1 and 7 were the data collection periods. Stages in between were the introduction of a number of interventions to improve pain management.

c There were three subsequent time periods following baseline data collection. Each stage had at least 525 patients in the study hospital and at least 375 in the control hospital.

d Retrospective chart review

e Pain ratings greater than four were taken to indicate inadequate analgesia

f Pre and post introduction of an acute pain service

g None, Mild, Discomfort, Severe, Horrible and Excruciating.

h Pain was assessed at rest, during movement and on deep inspiration.

*Appendix 3* ***Ethical approval***

FEDERATED
DUBLIN
VOLUNTARY
HOSPITALS

P.O. Box 795,
James's Street,
Dublin 8.
Telephone : 453 2385 ( 6 Lines )
Fax : 453 7594

Meath, Adelaide, National Children's Hospitals.

ST. JAMES'S HOSPITAL
NURSING ADMINISTRATION
22 DEC 1994

20th December 1994

Miss P. Taaffe,
Director of Nursing,
St. James's Hospital.

RE: THE NURSE'S ROLE IN PAIN MANAGEMENT

Dear Miss Taaffe,

This is to confirm that the Joint Research Ethics Committee at its meeting on 6th December 1994 agreed to give ethical approval to the above study.

Yours sincerely,

David R. Lynch

D.R. LYNCH
SECRETARY
JOINT RESEARCH ETHICS COMMITTEE

c.c. Ms. Kathleen MacLellan, Dept. of Community Health, TCD.

jm

## *Appendix 4 Letters asking for permission*

Nursing Administration,

xx/04/95

Dear CONSULTANT,

Miss Taaffe corresponded with you in December last year with regard to a study of the nurses' role in pain management. I am the Nurse Researcher who will be conducting this project.

The aim of the study is to use the information gained to help develop the role of the nurse. It is planned to repeat the study in two years. The objective is to evaluate whether the implementation of a number of changes with regard to nursing in XXXXXX will make a difference to pain management on surgical wards or if any change in the patient's perception of pain is due to the passage of time.

The study is supported by XXXXX, Director of Nursing, Hospital A and by XXXXXX, Director of Nursing, Hospital B. The study will be supervised by Professor T. O Dowd in the Department of Community Health, T.C.D and advice is being given from Dr. T. Schnittger, Consultant Anaesthetist, St. James's Hospital.

All information obtained will remain confidential. Patients' names will not be used. The information obtained from the second hospital will be used for comparison purposes only. This project has been approved by the Federated Dublin Voluntary Hospitals, Joint Research Ethics Committee.

Information with regard to the outcome of the study and the interventions used will be available at the end of the study.

I enclose a copy of the patient questionnaire. I would appreciate it if you would give permission for your patients to be involved in the study. If you have reservations or queries with regard to the project, please contact me.

Yours sincerely,

_____

Kathleen Mac Lellan,
Nurse Researcher.

Nursing Administration
xx/04/95

Dear DIRECTOR OF NURSING,

I am presently working as Nurse Researcher in XXXXXX. I would like, if possible, to interview patients in the XXXXXX as part of my Ph.d.

The aim of the study is to use the information gained to help develop the role of the nurse. It is planned to repeat the study in two years. The objective is to evaluate whether the implementation of a number of changes with regard to nursing in XXXXX will make a difference to pain management on surgical wards or if any change in the patient's perception of pain is due to the passage of time.

The study is being supervised by Professor T. O Dowd in the Department of Community Health, T.C.D and advice is being given from Dr. T. Schnittger, Consultant Anaesthetist, St. James's Hospital.

All information from XXXXX hospital will remain confidential. Patients' names will not be used. This project has been approved by the Federated Dublin Voluntary Hospitals, Joint Research Ethics Committee.

Information with regard to the outcome of the study will be available at the end of the study. I enclose a copy of the patient questionnaire.

I will make an appointment with you to follow up this letter and I would be grateful for you support.

Thanking you,
Yours sincerely,

_____

Kathleen Mac Lellan,
Nurse Researcher.

*Appendix 5* *Fact sheet of study design*

# XXXXXX HOSPITAL

## INTRODUCTION

This is a nursing survey of your pain management during your hospital stay. We are asking patients about how their pain is after an operation. It is intended to use this information to make improvements to our patient care.

We are very interested to know how **YOUR** pain is during your stay in hospital. Your answers will be completely confidential. The survey will not affect in any way how your pain is treated.

## SURVEY

The survey consists of four parts.

***The first part.***
You will be asked to complete a short questionnaire before you go for your operation. At this stage you will be asked if you would like to be involved in the survey. If you wish to be involved XXXXXX will ask you some questions about whether you have had an operation before and how you think your pain will be.

***The second part.***
We would like to rate any pain you might have on a pain scale for two days after your operation.

***The third part.***
On the day after your operation we will ask you some short questions.

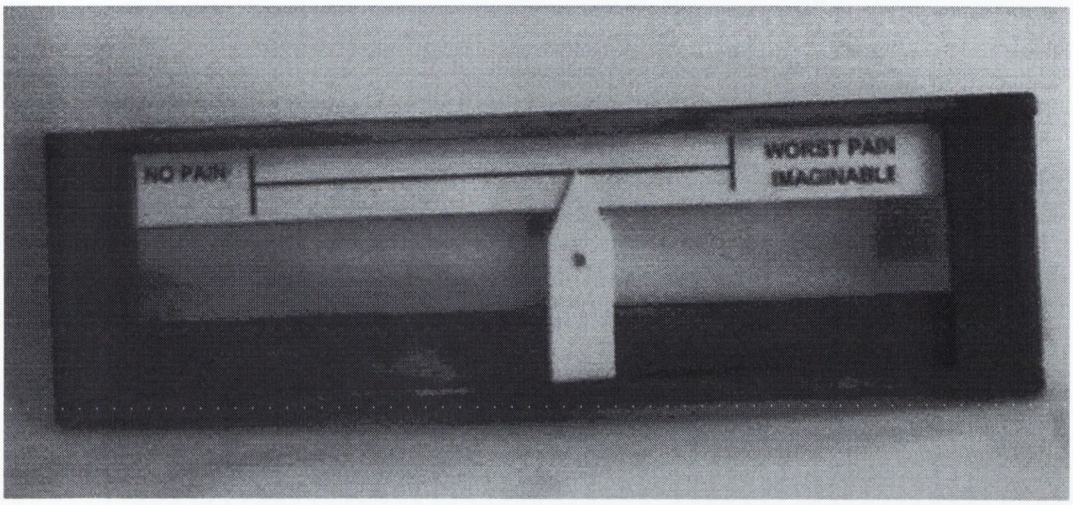
***The fourth part.***
On the day you are going home we will ask you to fill out a questionnaire asking you about your stay.

All of the information you give will be confidential. The information is to help us improve the way, we, as nurses treat pain. If at any stage you would like to leave the study just tell the research assistant. The research assistant will visit your ward several times during the day to rate your pain.

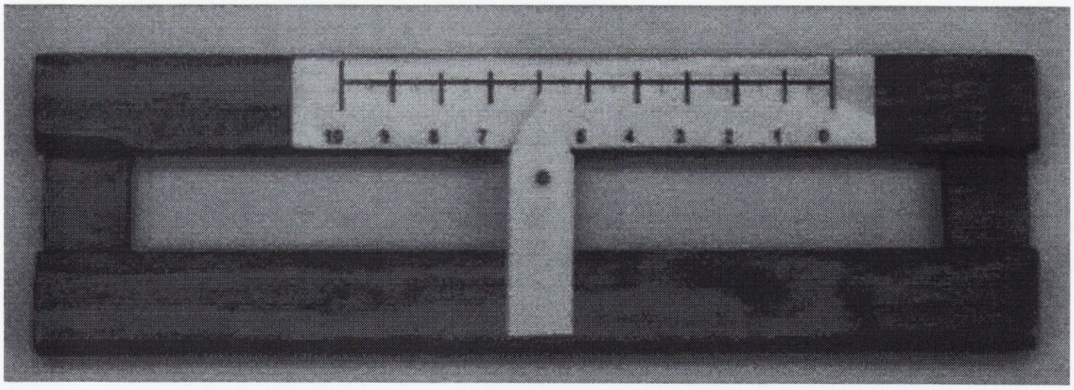
Thank you for being involved in the survey

## *Appendix 6 Pain scale*

Front pain scale




Back pain scale



*Appendix 7 Original questionnaire*

## *PATIENT DETAILS*

Registration number: ☐

Age: ☐ Years.

Gender: Male ☐ Female ☐

Weight: ☐ kgs.

Operation type:_____

Previous surgery: Yes ☐ No ☐

Pain prior to surgery: Yes ☐ No ☐

Length of stay: ☐ days.

## PRE OPERATIVE

**1. At this stage of your admission have you been seen by?**

- The Consultant ☐
- A Doctor ☐
- The Intern ☐
- The Anaesthetist ☐
- The Theatre Nurse ☐
- The Ward Sister ☐
- The Ward Nurse ☐
- The Student Nurse ☐

**2. How much pain do you expect to have after your operation?**

- No pain ☐
- Mild pain ☐
- Moderate pain ☐
- Severe pain ☐
- Don't know ☐
- Visual Analogue Score ☐

**3. If you are given medication for your pain after your operation, do you expect it to give you?**

No relief ☐

Little relief ☐

Moderate relief ☐

A lot of relief ☐

Complete relief ☐

**4. If you have pain after your operation, when would you most likely ask for pain relieving medicine?**

When having some pain---------- ☐

When pain becomes severe---------- ☐

Not ask, wait until it is offered---------- ☐

Ask, regardless of the amount of pain---------- ☐

Rather put up with the pain, than have medication---------- ☐

**5. If you asked for pain relieving medicine, when would you expect it to be given?**

Immediately, unless the nurse was interrupted in an emergency----- ☐

0 - 5 minutes---------- ☐

6 - 10 minutes---------- ☐

11 - 20 minutes---------- ☐

The next time the nurse is giving out medication---------- ☐

## POSTOPERATIVE

**1. Which of the following best describes the amount of pain you have had in the past 24 hrs?**

- No pain ☐
- Mild pain ☐
- Moderate pain ☐
- Severe pain ☐

**2. Did your pain relieving medication give:**

- No relief ☐
- Little relief ☐
- Moderate relief ☐
- A lot of relief ☐
- Complete relief ☐

**3. Which of the following best describes the length of time your pain has been relieved, overall?**

- None of the time ☐
- 25% of the time ☐
- 50% of the time ☐
- 75% of the time ☐
- All the time ☐

**4. In the last 24 hrs how much relief have you got from pain killers?**

No relief---------- ☐

Little relief---------- ☐

Moderate relief---------- ☐

A lot of relief---------- ☐

Complete relief---------- ☐

No analgesics received in previous 24hrs---- ☐

**5. When pain returned following a pain relieving medication, did you?**

Ask for another---------- ☐

Wait for another to be offered or given-------- ☐

**6. Did pain interrupt your sleep?**

Yes ☐ No ☐

*Visual Analogue Scale:*

**7. Pain score now**---------- ☐

**8. Worst pain score in last 24 hours**---------- ☐

**9. Best pain score in last 24 hours**---------- ☐

**10. Time of worst pain**---------- ☐

**11. Usual pain in last 24 hours**---------- ☐

**12. Overall pain score in the last 24 hours**--------- ☐

## DAY OF DISCHARGE

**1. Did anyone give you information about pain before your operation?**

Yes ☐ No ☐

**2. Who gave you information before your operation?**

Nurse ☐

Doctor ☐

Anaesthetist ☐

Relatives/friends ☐

Other patients ☐

Other ☐ *please specify:*_____

**3. What information about pain were you given?**

_____

_____

_____

**4. After your operation, did anyone give you information about pain?** Yes ☐ No ☐

**5. If yes at what stage was it after your operation?**

_____

**6. Who gave you information after your operation?**

Nurse ☐

Doctor ☐

Anaesthetist ☐

Relatives/friends ☐

Other patients ☐

Other ☐ *please specify:*_____

**7. What information were you given?**

_____

_____

*Questions 8 and 9 relate to information given before your operation*

**8. In retrospect was the information adequate?** Yes ☐ No ☐

**9. What other information would you like to have been given?**

_____

_____

_____

*Questions 10 and 11 relate to information given after your operation*

**10. Was information given adequate?** Yes ☐ No ☐

**11. What other information would you like to have been given?**

_____

_____

_____

**12. Who did you think should decide when you should receive more pain killers?** *(can choose more than one option)*

Nurse ☐

Doctor ☐

Anaesthetist ☐

Consultant ☐

Yourself ☐

Other ☐ *please specify:* _____

**13. Did you feel that your pain was believed?** Yes ☐ No ☐

**14. Did you have any fears with regard to your pain?** Yes ☐ No ☐

**15. If answer to question 14 is yes what fears did you have?**

_____

_____

_____

**16. Did you have any fears with regard to your pain relief?**

Yes ☐ No ☐

**17. If answer to question 16 is yes what fears did you have?**

_____

_____

_____

**18. Did you have any difficulties describing your pain with regard to**

**- the nature of the pain?** Yes ☐ No ☐

**- the intensity of the pain?** Yes ☐ No ☐
*(how severe the pain was)*

**19. Would you have liked more control over your pain relief?**

Yes ☐ No ☐

**20. Do you think that it is likely that a patient could become addicted to strong pain killers in hospital?**

Yes ☐ No ☐

**21. What bothered you most after your operation?**

Naso-gastric tube ☐

Drip site ☐

Drain ☐

Site of pain ☐

Other ☐ *please specify:*_____

**22. After your operation did you have?**

Nausea ☐

Vomiting ☐

Headache ☐

Drowsiness ☐

Confusion ☐

Sore throat ☐

**23. How satisfied are you with the amount of pain relief you received?**

Visual Analogue Score ☐

**24. How satisfied are you with your overall pain management?**

Visual Analogue Score ☐

**25. Other comments?**

*Appendix 8* ***Final questionnaire***

**NAME:-** _____

**WARD:-** _____

**DATE ADMISSION:-** _____

**DATE DISCHARGE:-** _____

# QUESTIONNAIRE

## PATIENT DETAILS/ DEMOGRAPHICS

**Registration number:** ☐

**Age:** ☐ Years.

**Gender:** ❑ Male ❑ Female

**Weight:** ☐ kgs.

**Operation type:**_____

**Previous surgery:** ❑ Yes ❑ No

**Pain prior to surgery:** ❑ Yes ❑ No

**Length of stay post operation:** ☐ days.

## PRE OPERATIVE - PART 1

**1. At this stage of your admission have you been seen by the following and did they given you information about pain?**

| | | | |
|---|---|---|---|
| The Consultant | ❑ | Pain | ❑ |
| A Doctor | ❑ | Pain | ❑ |
| The Anaesthetist | ❑ | Pain | ❑ |
| The Theatre Nurse | ❑ | Pain | ❑ |
| The Ward Sister | ❑ | Pain | ❑ |
| The Ward Nurse | ❑ | Pain | ❑ |
| The Student Nurse | ❑ | Pain | ❑ |
| Do not know | ❑ | | |

**2. Do you expect to have pain after your operation?**

❑ Yes ❑ No

*If answer to question 2 is yes do you expect:*

❑ Mild pain
❑ Moderate pain
❑ Severe pain
❑ Don't know

Visual Analogue Score ☐

**3. If you are given medication for any pain you might have after your operation, do you expect it to give you?**

❑ Complete relief
❑ A lot of relief
❑ Moderate relief
❑ Little relief
❑ No relief
❑ Do not know

**4. If you have pain after your operation, when would you most likely ask for a pain killer?**

- ❑ Ask, regardless of the amount of pain
- ❑ When pain becomes severe
- ❑ Not ask, wait until it is offered
- ❑ Rather put up with the pain, than have medication

**5. If you asked for a pain killer, when would you expect it to be given?**

- ❑ Immediately, unless the nurse was interrupted in an emergency
- ❑ 0 - 5 minutes
- ❑ 6 - 10 minutes
- ❑ 11 - 20 minutes
- ❑ The next time the nurse is giving out medication

## POSTOPERATIVE - PART 2

**1. Which of the following best describes the amount of pain you have had in the past 24 hrs?**

- ❑ No pain
- ❑ Mild pain
- ❑ Moderate pain
- ❑ Severe pain

**2. Did your pain killers give you?**

- ❑ No relief
- ❑ Little relief
- ❑ Moderate relief
- ❑ A lot of relief
- ❑ Complete relief
- ❑ Did not have any pain killers

**3. Which of the following best describes the length of time your pain has been completely relieved, since you have returned from theatre?**

- ❑ None of the time
- ❑ 25% of the time
- ❑ 50% of the time
- ❑ 75% of the time
- ❑ All the time

**4. When pain returned following a pain killer, did you?**

- ❑ Ask for another regardless of amount of pain
- ❑ Ask for another when pain became severe
- ❑ Wait for another to be offered or given
- ❑ Put up with the pain, rather than have medication

**5. Did pain prevent you sleeping?**

❑ Yes ❑ No

**6. Did pain wake you up?**

❑ Yes ❑ No

**7. Pain score now**---------- ☐

**8. Worst pain score in last 24 hours**---------- ☐

**9. Least pain score in last 24 hours**---------- ☐

**10. Time of worst pain**---------- ☐

**11. Overall pain score in the last 24 hours**---------- ☐

## DAY OF DISCHARGE - PART 3

**1. Did anyone give you information about pain before your operation?**

❑ Yes ❑ No ❑ Can not remember

*If answer to question 1 is yes:*

**(A) Who gave you information before your operation? [Can <u>choose</u> more than one option]**

❑ Nurse
❑ Doctor
❑ Anaesthetist
❑ Relatives/friends
❑ Other patients
❑ Other *please specify:*_____

**(B) What information about pain were you given?**

_____
_____
_____

**2. After your operation, did anyone give you information about pain?**

❑ Yes ❑ No ❑ Can not remember

*If answer to question 2 is yes:*

**(A) At what stage was it after your operation?**

_____

**(B) Who gave you information about pain after your operation? [Can <u>choose</u> more than one option]**

❑ Nurse
❑ Doctor
❑ Anaesthetist
❑ Relatives/friends
❑ Other patients
❑ Other *please specify:*_____

**(C) What information were you given?**

_____

*Questions 3 and 4 relate to information given before your operation*

**3. Looking back was the information adequate?** ❑ Yes ❑ No

**4. Was there any other information you would like to have been given?**

_____
_____
_____

*Questions 5 and 6 relate to information given after your operation*

**5. Was information given adequate?** ❑ Yes ❑ No

**6. Was there any other information you would like to have been given?**

_____
_____
_____

**7. Who did you think should decide when you should receive more pain killers?**
**[Can choose more than one option]**

❑ Nurse
❑ Doctor
❑ Anaesthetist
❑ Consultant
❑ Yourself
❑ Other *please specify:*_____

**8. Did you feel that your pain was believed?** ❑ Yes ❑ No

**9. Did you have any worries with regard to your pain?** ❑ Yes ❑ No

*If answer to question 9 is yes what worries did you have?*

_____
_____
_____

**10. Did you have any worries with regard to your pain relief?**

❑ Yes ❑ No

**11. If answer to question 10 is yes what worries did you have?**

_____
_____
_____

**12. Did you have any difficulties describing your pain with regard to**

**(a) the nature of the pain?** ❑ Yes ❑ No
**(b) the intensity of the pain?** ❑ Yes ❑ No
*(how severe the pain was)*

**13. Would you have liked more control over your pain relief?**

❑ Yes ❑ No

**14. Do you think that it is likely that a patient could become addicted to strong pain killers in hospital?**

❑ Yes ❑ No

**15. Did the following bother you after your operation? [Can <u>choose</u> more than one option]**

❑ Naso-gastric tube
❑ Drip site
❑ Drain
❑ Site of pain
❑ Plaster of Paris
❑ Other *please specify:*_____

**16. After your operation did you have? [Can <u>choose</u> more than one option]**

❑ Nausea
❑ Vomiting
❑ Headache
❑ Drowsiness
❑ Disorientation
❑ Sore throat

**17. How satisfied are you with the amount of pain relief you received?** *(Please mark on the line)*

**NOT SATISFIED** |——————————————————————| **VERY SATISFIED**

**18. How satisfied are you with your overall pain management?**
*(Please mark on the line)*

**NOT SATISFIED** |——————————————————————| **VERY SATISFIED**

**19. Any other comments?**

_____
_____
_____
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_____
_____
_____
_____
_____
_____
_____

---

**THANK YOU FOR YOUR HELP**

---

## *Appendix 9 Operation Categories*

| OPERATIONS - MAJOR |
| --- |
| Austin Moores Posthesis |
| Discectomy |
| Dynamic Hip Screw |
| Gastrectomy |
| Hysterectomy |
| Nephrectomy |
| Nissens fundiplication |
| Pelvic Clearance |
| Pelvic Floor Repair |
| Repair Fractured acetabulum |
| Sigmoid colectony |
| Total Abdominal Hysterectomy |
| Total Abdominal Hysterectomy and Bilatoral Salpingo Oophorectomy |
| Total knee replacement |
| Vaginal Hysterecomy |
| Vaginal Hysterecomy and pelvic floor repair |
| **OPERATIONS - INTERMEDIATE** |
| Amputation belov elbow |
| Appendicectomy |
| Application external fixator |
| Bilateral metatarsal head osteotomy |
| Circumcision |
| Colles fracture |
| Correction foot |
| Cystectomy |
| Cystolitopaxy |
| Cystoscophy and removal stent |
| Cystoscophy and TURP |
| Debridement of wound |
| Excision hydrocele |
| Excision pilonidal sinus |
| Hernia repair |
| IM nail femur |
| IM Nail Humerus |
| Insertion femoral nail |
| Internal fixation/AO screw left hip |
| Laproscopic cholecystectomy |
| Laproscopic Nissens Fundiplication |
| Nesbits procedure |
| Open reduction and internal fixation (ORIF) ankle |
| Orchidectomy and prosthesis |
| ORIF clavicle |
| ORIF femur |
| ORIF fractured clavicle |
| ORIF fractured humerus |
| ORIF fractured patella |
| ORIF fractured tibia and fibula |
| ORIF fractured ulna |
| ORIF patella |
| ORIF radius |
| ORIF Ulna |
| Patellectomy |
| Pilonidal sinus |
| Prostatectomy |
| Release Dupuytrens contracture |
| Removal cyst |
| Removal of external fixator |
| Removal of screw |
| Removal Pin and Plate Femur |
| Removal pin left wrist |
| Removal renal stent and stone manipulation |
| Removal tibial nail |
| Removal Ureter stent and stone manipulation |
| Repair fractured femur |
| Repair inguinal hernia |
| Repair tendon patella |
| Revision and rewiring of trocanter |
| Scapula fracture |
| Trans Urethral Resection of Prostate |
| Uteroscophy and stone manipulation |

*Appendix 10* *Pain score marking sheet*

## PAIN SCORE RECORD SHEET

Name:_____
Registration Number:_____
Date of operation:_____
Time returned from theatre:_____

| DAY | TIME | PAIN SCORE/ Comments |
|---|---|---|
| Day of operation | 11 am | |
| | 2 pm | |
| | 5 pm | |
| | 8 pm | |
| Day 1 post | 8 am | |
| | 11 am | |
| | 2 pm | |
| | 5 pm | |
| | 8 pm | |
| Day 2 post | 8 am | |
| | 11 am | |
| | 2 pm | |
| | 5 pm | |
| | 8 pm | |

***Appendix 11*** ***Pain chart***

# Pain Assessment Chart

SURNAME: _____

FIRST NAMES: _____

HOSPITAL NO.: _____

COMMENCED: _____

WARD: _____

TO PAIN INTENSITY:

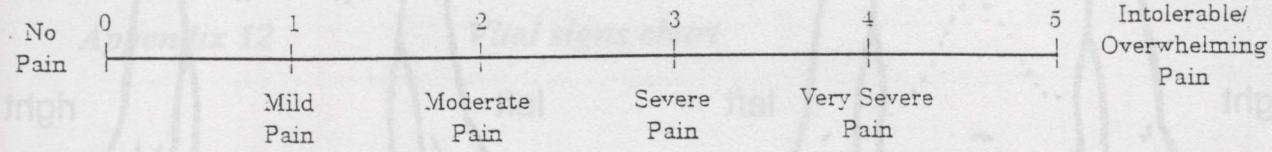
No Pain
Mild Pain
Moderate Pain
Severe Pain
Very Severe Pain
Intolerable/Overwhelming Pain
Sleeping

**Is Pain ❑ Constant or ❑ Intermittent**

Have patient describe pain in his/her own words...

❑ THROBBING ❑ SHARP
❑ DULL ❑ GNAWING
❑ SHOOTING ❑ BURNING
❑ STABBING OTHER WORD: _____

y be easier to determine the intensity of pain by looking at the pain scale below:




| DATE | TIMES | PAIN SITES | | | | | | | | ANALGESIA Name, Route & Dose | PATIENT ACTIVITY AND COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | | |
| | | | | | | | | | | | |
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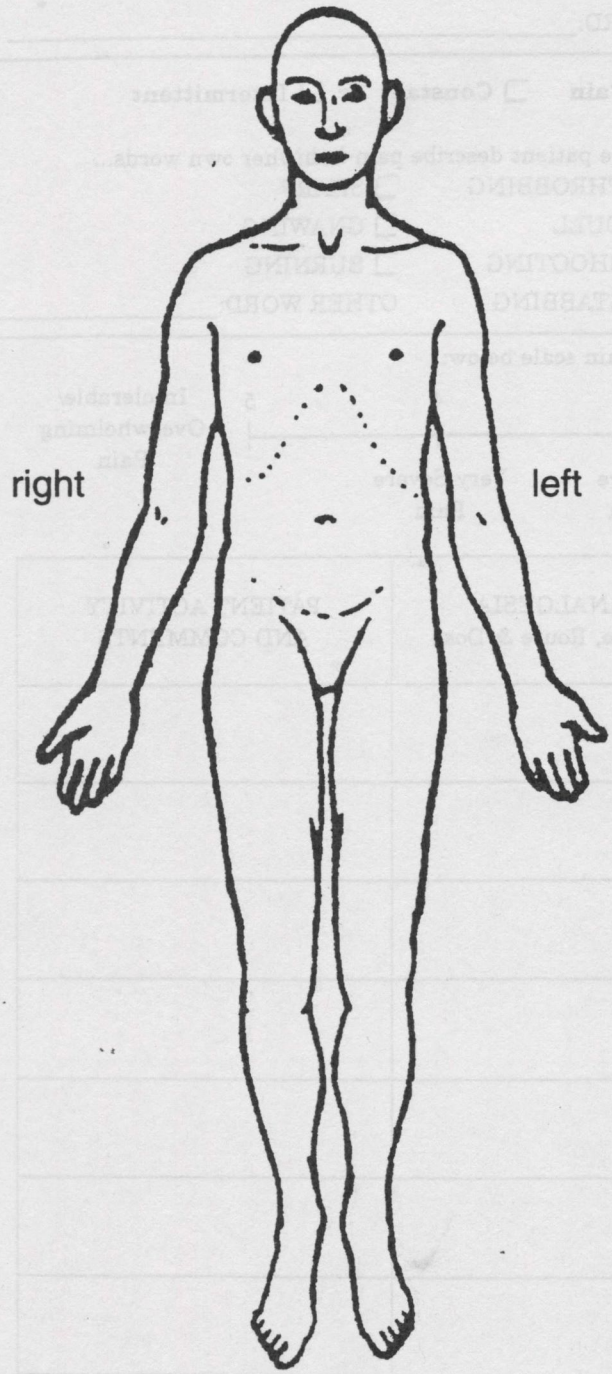
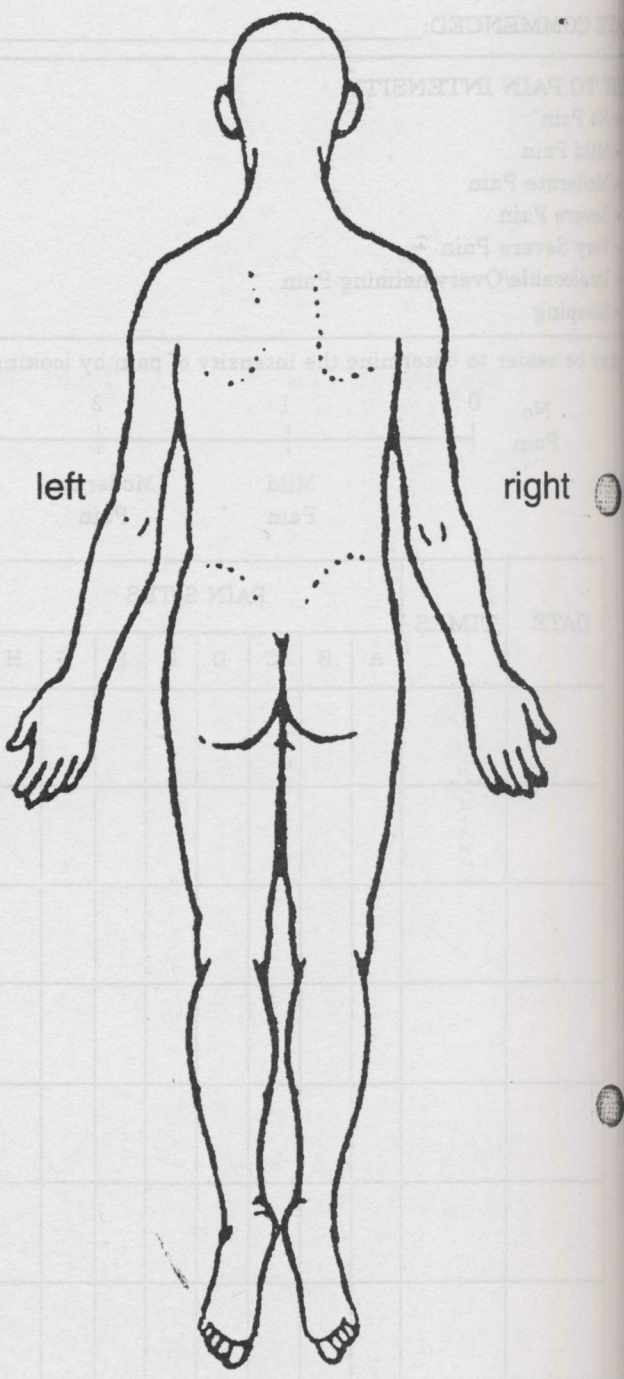
## PAIN SITES

Please draw on the body outlines below to show where you feel pain.
Label each site of pain with a letter A, B, C, etc.




### NOTES FOR USING ASSESSMENT CHART

Factors which make pain worse and factors which relieve pain should be noted under patient activities and comments.

Objectives should be realistic and should aim to relieve pain to an acceptable level, i.e.

**pain free**

(i) at night
(ii) at rest
(iii) on moving

***Appendix 12*** ***Vital signs chart***

ecord **Daily** (Afternoon) Or more frequently if required.

*TH* ..... *YEAR* .....

SURNAME .....

FIRST NAMES .....

HOSPITAL NO. .....

| | | | | | | | | | | | | | | | | | | | | | | |
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| 250 | 42 | | | | | | | | | | | | | | | | | | | | | |
| 240 | 41 | | | | | | | | | | | | | | | | | | | | | |
| 230 | 40 | | | | | | | | | | | | | | | | | | | | | |
| 220 | 39 | | | | | | | | | | | | | | | | | | | | | |
| 210 | 38 | | | | | | | | | | | | | | | | | | | | | |
| 200 | 37 | | | | | | | | | | | | | | | | | | | | | |
| 190 | 36 | | | | | | | | | | | | | | | | | | | | | |
| 180 | 35 | | | | | | | | | | | | | | | | | | | | | |
| 170 | 34 | | | | | | | | | | | | | | | | | | | | | |
| 160 | | | | | | | | | | | | | | | | | | | | | | |
| 150 | | | | | | | | | | | | | | | | | | | | | | |
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| 110 | | | | | | | | | | | | | | | | | | | | | | |
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| 90 | | | | | | | | | | | | | | | | | | | | | | |
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*Appendix 13* *Reading material*

## PRINCIPLES OF PAIN MANAGEMENT

❑ **Do not wait for a patient to complain - ask and observe**
Patients with pain do not always complain or even look in pain. Pain cues may lie in disturbed sleep, restless patients and limitations on mobility/ activities. Some patients prefer to talk about "discomfort" or "soreness" rather than "pain".

❑ **Accurately diagnose the cause of pain and site of pain**
Many patients have more than one site of pain.

❑ **For continuos pain use regular analgesia in doses titrated to each individual, that ensures that pain doe not return**
"As needed" or "PRN" administration on its own will not control continuous pain.

❑ **For acute pain use a preventative/ pre-emptive approach**

❑ **Reassess at regular intervals**
Accurate dosing of analgesia requires reassessment. Pain charts can be helpful.

❑ **Listening, understanding, distraction and attention to mood are as important as the use of drugs**

## DEFINITION OF PAIN

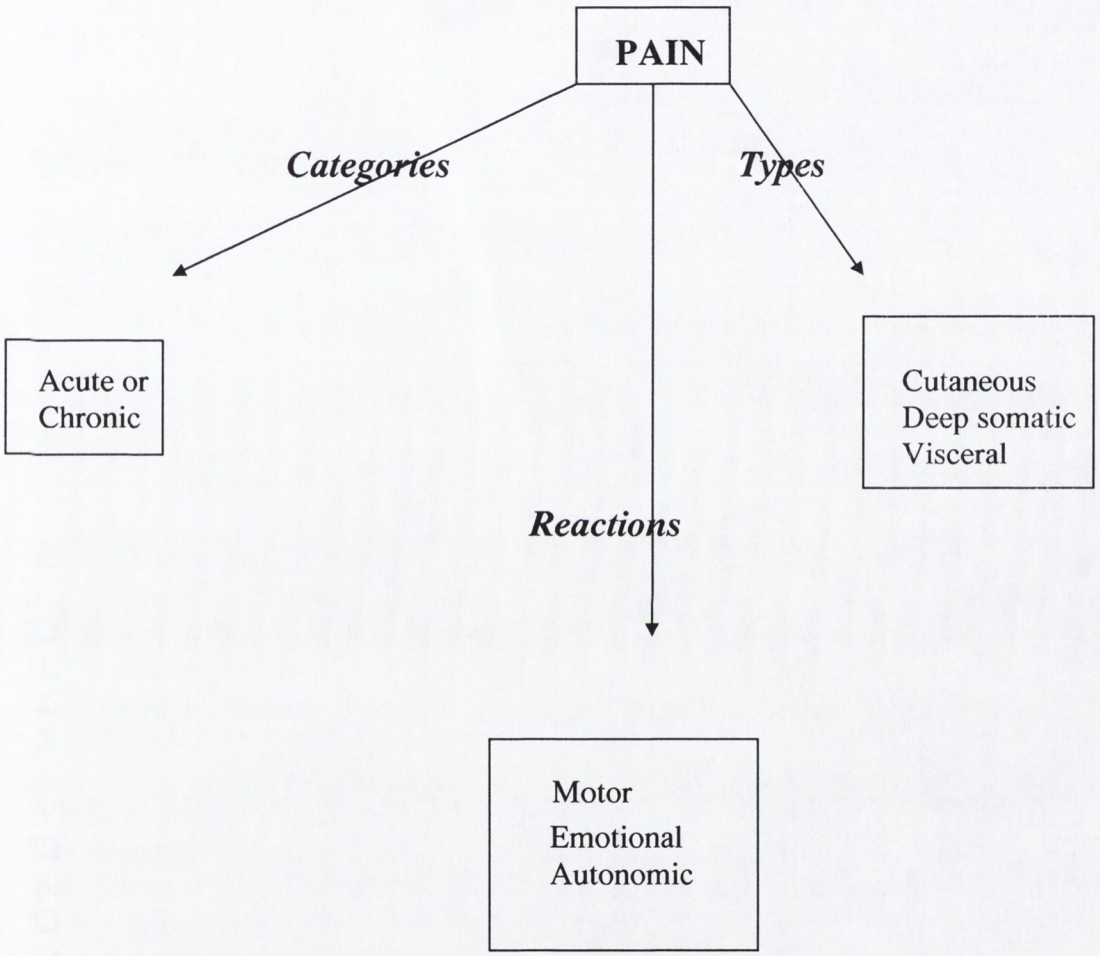
Pain is caused by stimulation of nerve fibres called nociceptors. Pain is different form other sensations in that it has an in built unpleasantness and a strong emotional component. Pain is a sensory and an emotional experience. There are many definitions of pain, McCaffrey said in 1972 that **"Pain is whatever the experiencing person says it is existing whenever he says it does"**

The perception and the response to pain are the results of complex interactions of many factors. For these reasons there are difficulties in trying to define pain.

***Influences on how a person experiences pain include:***

❑ Past experience of pain
❑ Family attitudes/ culture
❑ What the situation means to the person
❑ How much attention the person gives to their pain
❑ How anxious the person is
❑ Suggestion
❑ Other factors unique to the individual.

# PAIN PHYSIOLOGY




***PAIN CATEGORIES***

Pain is usually classified into two major categories i.e. acute or chronic.
Acute pain can be defined as an episode of pain of sudden onset and of short duration with a foreseeable end, usually less than six months. Chronic pain is more prolonged, pain that persists beyond the usual course of an acute disease or a reasonable time for an injury to heal.

Pain has three major components, **a motor reaction, an emotional response** and an **autonomic response.**

*Pain reactions*

❑ **Motor reactions** are reflexes which remove part or all of the body from the painful stimulus i.e. a withdrawal reflex.
❑ **Emotional reactions.** Pain has an in built unpleasant effect in people. Reactions include anxiety, anguish, crying, depression and so on.
❑ **Autonomic reactions** include tachycardia, peripheral vasoconstriction, a rise in blood pressure, dilation of pupils and sweating.

*PAIN TYPES*

According to the site of stimulation, pain can be classified into **cutaneous**, **deep somatic** or **visceral pain**.

**Cutaneous pain** is produced by stimulation of pain receptors of the skin.
❑ It can be accurately localised. This is due to the large number of receptors in the skin. Besides this touch and vision greatly increase localisation of cutaneous pain.

**Deep somatic pain** is produced by stimulation of pain receptors in deep structures i.e. muscles, bones, joints and ligaments.
❑ Unlike cutaneous pain deep somatic pain is **dull, diffuse, intense and prolonged.**
❑ It is usually associated with **autonomic stimulation** e.g. sweating, vomiting and changes in heart rate and blood pressure.
❑ Pain from deeper structures can also initiate reflex contraction of nearby muscles e.g. muscle spasm associated with bone fractures.
❑ The adequate stimuli for deep somatic pain include:
1. Mechanical forces e.g. severe pressure on a bone, traction of a muscle or ligament.
2. Chemicals e.g. venom, acids or alkalis.
3. Ischaemia e.g. muscle ischaemia (angina).

**Visceral pain** is that produced by stimulation of pain receptors in the viscera.
❑ Pain receptors in the viscera are **sparsely distributed** and therefore severe visceral pain indicates diffuse stimulation of pain receptors from a wide area of the viscus.
❑ It is **poorly localised**.
❑ It is often referred or **radiates** to other sites
❑ It is often associated with **autonomic disturbances** e.g. vomiting, sweating, tachycardia.
❑ It can be associated with rigidity and tenderness of nearby skeletal muscles.

## *Pain receptors*

Pain receptors are called nociceptors. These are free nerve endings found in almost every tissue of the body. There are two main types of nerve fibres involved in the transmission of pain:- A delta fibres and C fibres. A delta fibres are small diameter fibres which are myelinated and conduct the transmission of pain rapidly. C fibres are also small diameter fibres which are not myelinated and conduct the transmission of pain slower. Once pain receptors are stimulated the impulse they discharge travels to the spinal cord and on to the brain via the pain pathways. Nociceptors can be

sensitised so that they may continue to send pain messages long after the stimulus is removed.

## Stimuli for nociceptors include the following:-

- Touch
- Pressure
- Heat
- Cold
- Distension or dilation of a structure
- Prolonged muscular contraction
- Muscle spasm
- Inadequate blood flow to an organ
- Presence of certain chemical substances
- Inflammation

### *TYPES OF PAIN SENSATION*

There are two main types of pain sensation, fast pain and slow pain. The type of pain sensation dictates the bodie's reaction to pain and the way pain is perceived by the individual.
**Fast pain** is a well localised pin prick sensation that results from activating the nociceptors on the **A delta fibres**. **Slow pain** is a poorly localised, dull burning sensation that results from activating the nociceptors on the **C fibres**.

**Fast pain evokes:**
- ❑ A withdrawal reflex
- ❑ A sympathetic response including an increase in blood pressure and
- ❑ A mobilisation of body energy supplies.

**Slow pain evokes:**
- ❑ Nausea
- ❑ Sweating
- ❑ Lowering of blood pressure
- ❑ A reduction in skeletal muscle tone.

### *PAIN PATHWAYS*

The main pathway is via the **spinothalmic tract**. The pathways are named according to where they start and end. The spinothalamic tract starts in the spinal cord and travels to the thalamus. Conscious recognition of pain occurs in the thalamus but is not localised until it reaches the cerebral cortex. The limbic system alters perception of pain.

SITE OF PAIN

At the site of pain certain chemicals are found. These include:-

- Histamine
- Prostoglandins
- Bradykinin
- Serotonin
- Substance P

The exact role of these chemicals is not fully understood.

## Chemicals released at the site of injury:-

Histamine, prostoglandins and bradykinin are thought to exite nociceptors thus increasing the pain sensation.

| | |
|---|---|
| **PROSTOGLANDINS** | Are very specialised fatty acids. They are found at the site of injury. They can cause vasodilation or vasoconstriction, muscle contraction or relaxation and increase intensity of pain. |
| **HISTAMINE** | Is released at the site of injury and causes vasodilation and oedema. Its role in pain sensation is unclear. |
| **BRADYKININ** | Is released upon tissue injury and is present in inflammatory exudates. It evokes a response in nociceptors. |

## Neurotransmitters:-

Serotonin and substance P are both neurotransmitters and are thought to stimulate the perception of pain. Neurotransmitters facilitate, exite or inhibit postsynaptic neurons. They establish the lines of contact between brain cells.

| | |
|---|---|
| **SUBSTANCE P** | Found in sensory nerves, spinal cord pathways and parts of the brain associated with pain; stimulates perception of pain. Endorphins may exert their pain inhibiting properties by suppressing release of substance P. |
| **SEROTONIN** | Facilitates pain in nociceptors. |

### *NEUROPEPTIDES:-*

Neuropeptides are chemical messengers in the brain. Most act primarily to modulate the response of or the response to a neurotransmitter.

| | |
|---|---|
| **ENKEPHALINS** | Concentrated in the thalamus, hypothalamus, parts of the limbic system and spinal cord pathways that relay pain impulses. They inhibit pain impulses by suppressing substance P. It is suggested that enkephalins are the body's natural pain killers. They do this by inhibiting impulses in the pain pathway and by binding to the same receptors in the brain as morphine. |
| **ENDORPHINS** | Concentrated in the pituitary gland. They also function by inhibiting substance P. Like enkephalins they have morphine like properties that suppress pain. |
| **DYNORPHIN** | Found in the posterior pituitary gland, hypothamamus and small intestine. May be related to controlling pain. |

*GATE CONTROL THEORY*

This theory suggests that pain impulses must pass through a gating mechanism in the substantia gelantosia cells in the dorsal horn of the spinal cord to the brain. The theory proposes that a neural mechanism here acts like a gate which can increase or decrease the flow of impulses. When the gate is open pain impulses flow through easily, when the gate is closed no pain impulses can get through and when the gate is partially open, only some of the pain impulses pass through. It is suggested that descending influences from the brain such as attention, anxiety, anticipation and past experience can exert control over the gate. This theory is not fully explained and is disputed by some.

The theory proposes that activity from large diameter fibres (carrying such information as touch) closes the gate and small fibre activity opens the gate.

*Indications of pain*

**Pain of low to moderate intensity:- sympathetic responses**

- ❑ Pallor
- ❑ Elevated blood pressure
- ❑ Dilated pupils
- ❑ Skeletal muscle tension
- ❑ Increased respirations
- ❑ Increased heart rate

**Pain of severe intensity, deep pain:- parasympathetic responses**

- ❑ Pallor
- ❑ Decreased blood pressure
- ❑ Nausea and vomiting
- ❑ Weakness and fainting
- ❑ Prostration
- ❑ Possible loss of consciousness

## ADVERSE AFFECTS OF HAVING SEVERE PAIN

- ❑ **Nausea.** High pain levels have been associated with an increased risk of nausea
- ❑ **Ability to deep breathe** is diminished, which may promote respiratory infections
- ❑ **Reduced mobility.** This leads to an increased risk of DVTs and damage to pressure areas
- ❑ **Psychological effects**, these include anxiety, fear, helplessness and sleep deprivation
- ❑ **Sympathetic nervous system**. Increase in pulse and B/P. Decreased motility of gut leading to paralytic ilius.
- ❑ **Socio-economic effects**. Convalescence has been shown to be slower, hospital stay is longer, increased nursing attention is required and decreased patient satisfaction.

# PAIN ASSESSMENT

## *PURPOSES OF PAIN ASSESSMENT*

The purpose of pain assessment is to act as a guide for the analgesic requirement of the patient.

**Pain assessment:**

- ❑ Allows the patient to be actively involved in his/ her care.
- ❑ Provides documentation of the patient's pain.
- ❑ Evaluates the effectiveness of analgesia.
- ❑ Provides objective not subjective measurement of patient's pain.
- ❑ Can help remove the inaccuracies that may occur when passing on pain information from different shifts and to different people.
- ❑ Helps determine intensity, quality and duration of pain.
- ❑ Helps establish if there is a pattern of pain.

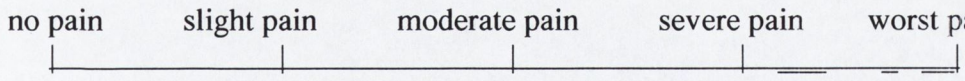
## *SUBJECTIVE PAIN MEASURES*

Pain has several aspects which can be difficult to measure. Pain appears to have three main dimensions, a sensory, an emotional and an intensity aspect. Pain measures are divided into single dimensional and multidimensional measures. Single dimensional scales measure pain intensity only. Multi-dimensional scales assess patients with regard to various dimensions of the pain experience.

## *MEASURES OF PAIN INTENSITY*

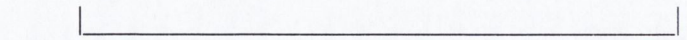
Pain intensity measures can be used quickly, they require only minimal instruction to patients and are easily scored. Very sick patients are not taxed. However most assume that patients are either literate or numerical.

**VERBAL/GRAPHIC RATING SCALE**




This type of scale generally comprises of 5 - 7 word categories. These word categories consist of descriptive pain words. The patient is asked to pick the word which best describes his/her pain. These words are then given a score. There are limitations involved however, as this method relies on the use of words. The difficulty is that it is necessary for the patient to translate a feeling into specific words, these words may not express exactly what the person is experiencing. Words can be ambiguous and the same word does not necessarily mean the same thing to each patient.

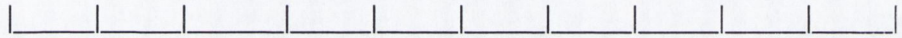
**VISUAL ANALOGUE SCALE**



no pain — worst pain imaginable

Each end of the scale is marked with labels that indicate the range being considered. Phrases such as "pain as bad as it could be" and "no pain" can be used. The patient is asked to place a mark on the line at a point representing the severity of his pain. The scale is scored by measuring the distance of a patient's mark from zero. The scale requires only about 30 seconds to complete . Factors which may influence its usability are learning, memory and perceptual judgement. The use of the VAS may not be possible in the elderly, the seriously ill or patients with organic brain disease. It is suggested that as much as 7% of the population would not be able to use it.

**NUMERIC RATING SCALE**



0 1 2 3 4 5 6 7 8 9 10

no pain — worst pain imaginable

This is another variation of the VAS and consists of asking the patient to rate his/her pain on a numerical scale 0 - 10 with 0 = no pain and 10 = worst pain imaginable. Difficulty with the scale does not appear to be associated with age. There may however be biases associated with this scale, some patients may have a preference or an aversion to certain numbers leading them to consistently choose or avoid this number.

***MULTIDIMENSIONAL MEASUREMENTS OF CLINICAL PAIN INTENSITY***

Multidimensional scales involve subscales which represent different aspects of pain. As with the single dimensional scales these scales also require a level of literacy and numerical skills.
This scale is more designed for chronic or cancer pain rather than acute pain.

**SHORT FORM MCGILL PAIN QUESTIONNAIRE (MPQ)**

A short form MPQ (SF-MPQ) has been developed. The main component of the SF-MPQ consists of 15 descriptors (11 sensory and 4 affective), which are rated on an intensity scale as 0 = none, 1 = mild, 2 = moderate or 3 = severe. Three pain scores are derived from the sum of the intensity rank values of the words chosen for sensory, affective and total descriptors. The SF-MPQ also includes the Present Pain Intensity(PPI) index of the standard MPQ and a Visual Analogue Scale. It compares well with the long form of the MPQ and provides some qualitative information as well as pain intensity information.

## SHORT FORM McGILL PAIN QUESTIONNAIRE

PATIENT'S NAME:_____ DATE:_____

| | NONE | MILD | MODERATE | SEVERE |
|---|---|---|---|---|
| THROBBING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| SHOOTING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| STABBING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| SHARP | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| CRAMPING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| GNAWING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| HOT-BURNING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| ACHING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| HEAVY | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| TENDER | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| SPLITTING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| TIRING-EXHAUSTING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| SICKENING | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| FEARFUL | 0)_____ | 1)_____ | 2)_____ | 3)_____ |
| PUNISHING-CRUEL | 0)_____ | 1)_____ | 2)_____ | 3)_____ |

NO PAIN |_____| WORST POSSIBLE PAIN

| | | |
|---|---|---|
| 0 | NO PAIN | _____ |
| 1 | MILD | _____ |
| 2 | DISCOMFORTING | _____ |
| 3 | DISTRESSING | _____ |
| 4 | HORRIBLE | _____ |
| 5 | EXCRUCIATING | _____ |

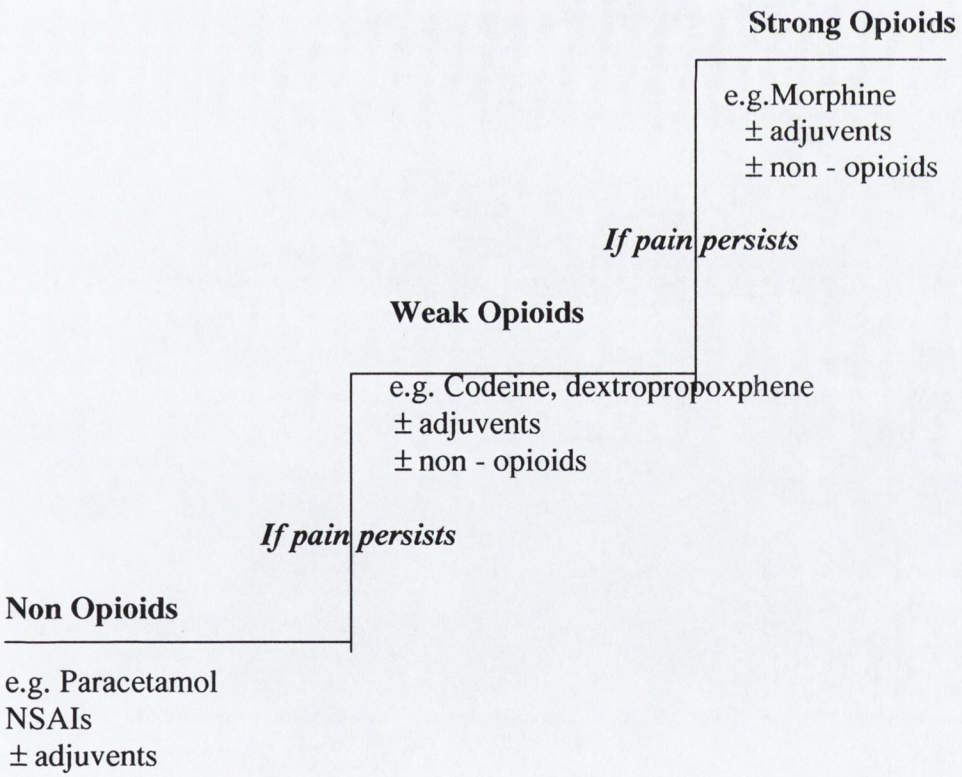
NURSES RESPONSIBILITY IN RELATION TO MEDICATION
FOR PAIN RELIEF

1. To determine whether or not the analgesic is to be given and if so, when.
2. To choose the appropriate analgesic when more than one is ordered.
3. To evaluate the effectiveness of the analgesic at regular, frequent intervals following each administration.
4. To be aware of or alert to the possibility of certain side effects from the analgesic.
5. To report promptly and accurately to the doctor when a change is needed.
6. To advise the patient about his/ her use of analgesics.

## PAIN MANAGEMENT

***Pharmacological management***

The analgesic ladder is a useful concept for treating mild, moderate and severe pain. When pain relief fails at one level, moving up one step of the ladder is a logical progression




WORLD HEALTH ORGANISATION ANALGESIC LADDER

This approach begins with the non - opioids or mild analgesics for mild pain. In patients with moderate pain that is not controlled by non - opioids alone, the so called weak opioids should be prescribed to be given alone or in combination. In patients with severe pain, a strong opioid is the drug of choice given alone or in combination.

## NON STEROIDAL ANTI-INFLAMMATORIES

**SITE OF ACTION**:- mainly peripheral nervous system
**ACTION**:- inhibits synthesis of prostoglandins

| USES | ADVERSE EFFECTS | CONTRA -INDICATIONS | CAUTIONS |
|---|---|---|---|
| Analgesia :- mild to moderate pain | Gastric ulceration | P.U.D. | Elderly |
| Suppression of inflammation | Induction of acute renal failure | Bleeding disorders | Smokers |
| Reduction of fever | Suppression platelet aggregation | Avoid in pregnancy | C.C.F. |
| Suppression of platelet aggregation | Hypersensitivity reactions | | Renal dysfunction |
| Dysmenorrhia | | | Liver disease |
| Bone metastasis | | | Hypovolaemia |
| R. A. | | | |

**SPECIAL ADVICE**

- ❑ Take with food or milk
- ❑ Do not chew or crush enteric coated tablets
- ❑ Curtail smoking
- ❑ Combine with sucralfate/ cytotec
- ❑ Ensure adequate fluid intake
- ❑ Caution in renal impairment
- ❑ No more than one agent at a time
- ❑ Use lowest possible dose
- ❑ Do not exceed max. daily dose
- ❑ If ineffective try an agent from another class

***Note:-*** *The analgesic action of the NSAI's is equal to paracetamol when given in a single dose, however if NSAI's are given regularly then their inflammatory action adds to their analgesic action.*

## NON STEROIDAL ANTI-INFLAMMATORIES AND THE ELDERLY:-

The elderly have increased susceptibility to side effects from the non-steroidal anti-inflammatories.

BNF 1996 guidelines for the use of non steroidal anti-inflammatories in the elderly:-

1st line treatment:
- Weight reduction
- Warmth
- Exercise
- Walking stick

If 1st line treatment inadequate add in paracetamol +/- low dose opioid.
If definite evidence of inflammation and above inadequate add in low dose NSAI.

For the elderly shorter acting agents safer e.g. ibuprofen/ volterol

# OPIOIDS

**SITE OF ACTION**:- central nervous system
**ACTION**:- activates opiate receptors in the brain and spinal cord

| USES | ADVERSE EFFECTS | CONTRA - INDICATIONS | CAUTIONS |
|---|---|---|---|
| Analgesia :- mod. to severe pain | Respiratory depression | Following biliary tract surgery | Decreased respiratory reserve |
| | Constipation | Interacts with alcohol | Head injuries |
| | Nausea and vomiting | | Labour |
| | Drowsiness | | Pregnancy |
| | Orthostatic hypotension | | Elderly |
| | Urinary retention | | Liver impairment |
| | Euphoria | | MAOI's |
| | Tolerance/ physical dependence | | Renal impairment |
| | miosis | | |
| | Cough suppression | | |

**SPECIAL ADVICE**

- ❑ Assess pain
- ❑ Assess respirations
- ❑ Identify high risk patients
- ❑ Opioid antagonist - naloxone

| *OPIOID RECEPTORS* | *ACTION* |
|---|---|
| Mu 1 | Analgesia |
| Mu 2 | Respiratory depression, euphoria, physical dependence, constipation |
| Delta | Analgesia |
| Sigma | ANS stimulation, dysphoria, hallucinations |
| Kappa | Analgesia, sedation |
| Epsilon | Analgesia |

*Non - opioid analgesics*

These include paracetamol and the non-steroidal anti-inflammatory drugs (NSAIs) of which aspirin is the most prominent member. They are commonly used orally and tolerance and physical dependence do not occur. Aspirin and the other NSAIs have analgesic, antipyretic, anti-inflammatory and antiplatelet actions. Paracetamol is equipotent to aspirin as an analgesic and an antipyretic but is much less effective in inflammatory conditions. Paracetamol lacks the gastrointestinal, hematopoietic and renal effects that can occur with aspirin. Paracetamol inhibits prostoglandins in the CNS not in the periphery. The NSAIs share the adverse effects of aspirin. The kidneys depend on prostoglandins for blood flow therefore NSAIs must be given with caution in renal impairment. Use cautiously in Hypovolaemia and asthmatics. Asthmatics are more prone to hypersensitivity reactions.

Table 1. Analgesics for mild to moderate pain.

| DRUG | DOSE | ONSET | DURATION | COMMENT |
|---|---|---|---|---|
| Aspirin | 300 - 600mg<br>4 - 6 hourly | 0.5 hr | 3-6 hrs | Gastric irritant<br>Anti - pyretic<br>Anti - platelet<br>Interacts with warfarin |
| Paracetamol | 0.5 - 1gram<br>6 hourly (max. 4g./24hrs) | 0.5 - 1 hr | 3-6hrs | Anti - pyretic |
| Naproxen | 250 - 500mg<br>12 hourly | 1hr | Up to 12 hrs | As aspirin |
| Diclofenac Na. | (PO) 50mg (max. 150mg/24hrs)<br>100mg S.R. (P.R.) | 1 hr<br>2-3 hrs | 6-8 hrs<br>4-8 hrs | As aspirin<br>Proctitis risk |
| Mefenamic Acid | 500mg (max. 2000mg/24hrs) | 1 hr | 6 hrs | As aspirin |

***Note:-*** *Time of onset and duration of analgesia are approximate and will vary from patient to patient.*

***Weak opioids***

Although codeine, dihydrocodeine and propoxyphene are weak opioids, they all share the same spectrum of pharmacological actions and therefore side-effects as morphine. These drugs all possess a higher analgesic potential than the non - opioids. Their potential is limited by adverse effects including sedation and constipation. Analgesia is enhanced by using a non - opioid in combination with an opioid analgesic.

Table 2. Analgesics for mild to moderate pain

| *DRUG* | *DOSE* | *COMMENT* |
|---|---|---|
| Codeine Phosphate | 15 - 60mg<br>4 hourly | Approx. 1/12 as potent as morphine |
| Dihydrocodeine | 30mg<br><br>4 hourly | Approx. 1/10 as potent<br>as morphine |
| Dextropropoxyphone (Doloxene) | 65mg<br>6 hourly | Norpropoxyphone has been reported to produce toxicity including delirium and seizures |

***Note:-*** *Most IM opiate analgesia has an on onset of 15 - 30 minutes and a duration of 4-5 hours with the exception of Pethidine which has a duration of approximately 3 hours, thus making it only suitable for acute pain*

**OPIOID ANALGESICS**

Strong opioid analgesics are the mainstay of therapy for severe cancer pain and acute postoperative pain. They are simple to administer and when properly used, provide effective pain relief for most patients. Morphine is the drug of choice. It has a relatively short half life (2-3 hours), and it is relatively easy to titrate the dose against the pain.

**Side effects**

1. Nausea and vomiting.

An antiemetic is not always necessary when morphine is prescribed. However patients with a history of nausea and vomiting with narcotic analgesics should have prophylactic anti-emetics prescribed. Vomiting with morphine is mainly an initial side effect and tolerance will develop.

2. Constipation.

All patients on long term morphine therapy should be prescribed laxatives

3. Drowsiness.

Drowsiness is usually mild, dose related and self limiting. If it persists check that the dose of the opioid is not too high.

4. Confusion.

Confusion and hallucinations may occasionally occur and may respond to reduction in dose or changing opioid.

5. The opioid analgesics can lead to dependence.

| RATIONALE FOR COMBINING TWO ANALGESICS |
|---|
| 1. Pain is attacked by two different mechanisms at two different levels, the peripheral nervous system level and the central nervous system level.<br>2. By adding a non-narcotic, analgesia may be significantly increased without increasing the narcotic side-effects. |

***Note:-*** *Aspirin and paracetamol are so readily available without prescription, their effectiveness is often underestimated by both health professionals and patients.*

| ROUTES OF ADMINISTRATION | | |
|---|---|---|
| ❑ Oral | ❑ Spinal | ❑ Inhalation |
| ❑ Intramuscular | ❑ Subcutaneous | ❑ Transdermal |
| ❑ Intravenous | ❑ Patient controlled analgesia | |
| ❑ Epidural | ❑ Per rectum | |

***Analgesic adjuvents***

A number of other classes of drugs may either enhance the effects of opioids or have an independent analgesic activity in certain situations. Not all pain is responsive to morphine and the use of co analgesics is essential to optimise pain relief.

**1. Tricyclic antidepressants:**
These agents relieve pain related to neuropathy and postherpetic neuralgia. They are frequently used to treat neuropathic pain that has been caused by surgical trauma, radiation therapy, chemotherapy or malignant nerve infiltration. Amitriptyline has the best documented analgesia but is also least tolerated because of its potent anticholenergic effects (dry mouth, urinary retention, delirium). Sedation and orthostatic hypotension are also frequent. The daily dose should be given at bedtime to promote sleep and minimise day time effects. The analgesic effects of trycyclics begin at lower doses (typically 10 mg/nightly, increasing to 75mg nightly for amytriptyline) than do their antidepressant effects.

**2. Steroids:**
They reduce pressure caused by oedema e.g. nerve compression, raised intracranial pressure, cord compression.

**3. Anticonvulsants:**
e.g. Phenytoin, Carbamazepine
These may relieve brief lancing pains arising from peripheral nerve syndromes such as trigeminal neuralgia, postherpatic neuralgia, glossopharyngeal neuralgia and post traumatic neuralgia. Nerve pain caused by cancer or chemotherapy sometimes give

rise to such pains. Carbamazepine is the drug of first choice. A suitable starting dose is 100mg twice daily.

**4. Benzodiazepines:**
These are effective for treatment of acute anxiety and muscle spasm associated with acute pain. They are also of some benefit to cancer patients in whom recurrent anxiety is apparent and antidepressants are not indicated. These agents have no analgesic properties and because of their sedative and respiratory depressant effects they may limit the amount of opioid which can be used.

**5. Muscle spasm:**
Hyoscine butylbromide 30 - 80 mg s/c infusion/ 24 hours. For painful muscle spasm of bowel and ureter. Side effects include anti-cholinergic effects.

Baclofen 5mg 8 hourly for painful skeletal muscle spasm.

**6. Hypnotics:**
A good nights sleep is important for patients' well being. Adequate night analgesia may be indicated.

**7. Other measures:**
Radiotherapy
Chemotherapy
Nerve block
TENS

Table 3. Adjuvents/Co-analgesics

| TYPE OF PAIN | DRUG TREATMENT | OTHER MEASURES |
|---|---|---|
| Bone pain | NSAIs<br>Analgesics<br>Steroids | Radiotherapy |
| Soft tissue infiltration<br>or<br>Visceral involvement | Analgesics<br>Steroids<br>NSAIs | Nerve block |
| Nerve compression | Analgesics<br>Steroids | Nerve block<br>Radiotherapy<br>TENS |
| Stabbing pain | Carbamazepine | Nerve block |
| Headaches from raised intracranial pressure | Steroids<br>Analgesics | Radiotherapy |
| Lymphoedema | Analgesics<br>Steroids | Elevation<br>Massage<br>Compression hosiery |
| Infection | Local/systemic antibiotics<br>Analgesics | Debridement<br>Local surgery |
| Muscle spasm | Diazepam<br>Baclofen | Massage<br>Heat |

***SPECIAL ADVICE for MORPHINE IN cancer pain*** *(BMJ 1996;Vol. 312;323-326)*

Always use the oral route first. When oral medication cannot be tolerated or adequately absorbed, when it becomes impractical to use or when it is necessary to allow rapid titration to relieve patients in severe pain the subcutaneous or intravenous route is necessary. A step by step approach to the choice of drugs is recommended, based on the WHO analgesic ladder.

Morphine is the preferred strong opioid analgesic. The dose is titrated up to achieve adequate relief of pain. There is no upper limit.

**ORAL MORPHINE:-**
Ideally two types of formulations are required: immediate release (for dose titration) and continued release (for maintenance treatment).

| | **Time to peak concentration** | **Elimination half life** | **Duration of analgesia** |
|---|---|---|---|
| **Immediate release** e.g. Sevredol Oromorph | 0.25 - 1 hour | 2 - 4 hours | 4 hours |
| **Controlled release** e.g M.S.T. | 2 - 4 hours | 2 - 4 hours | 12 hours |

The plasma elimination half life of morphine is 2 - 4 hours, and steady state is reached within four to five half lives that is within 24 hours after start of treatment and every dose adjustment. This is an important interval at which to re-evaluate a patient and adjust a dose. For patients maintained on a 12 hourly regimen of controlled release formulation, the appropriate rescue dose of an immediate release formulation will be one third of the regular dose.

The total daily dose of morphine should be reviewed daily (controlled release + immediate release). The amount should be totalled and divided by two to decide on new controlled release dosing e.g. A patient is on M.S.T. 20mg twice daily at 8 a.m. and 8 p.m., this patient receives Oromorph suspension 10mg at 10 a.m. and 5 p.m. as breakthrough pain management. In total this patient has received 60 m.g. of morphine in 24 hours. The M.S.T. continous dose should be increased to 30mg twice daily.

***A laxative must always be prescribed with morphine.***

**ALTERNATIVE ROUTES OF MORPHINE:-**
If patients are unable to take morphine orally the preferred alternative routes are rectal and subcutaneous. The bioavailablity of morphine by rectal and oral routes are the same.

The relative potency of rectal and oral morphine is about 1:1
The relative potency of oral and subcutaneous morphine is about 1:2
The relative potency of oral and intravenous morphine is about 1:3

There is generally no indication for giving morphine intramuscularly for chronic cancer pain because the subcutaneous route is simpler and less painful. Subcutaneous morphine may not be practical in patients

(a) with generalised oedema
(b) who develop erythema, soreness or sterile abscess with s/c morphine
(c) with coagulation disorders
(d) with very poor peripheral circulation

In these patients intravenous administration is preferred.

**TENS**

Transcutaneous electrical nerve stimulation (TENS) is a small, light weight battery operated pulse generator, used externally with two or more small electrodes to alleviate localised pain by transmitting mild electrical currents to peripheral nerves or to a particular pain site.
Continuous stimulation is best for pain due to tissue damage (nociceptive damage), such as bone metastasis, joint pain or visceral referred pain. Pulsed stimulation is sometimes better for neuropathic pain.

Various hypothesis have been advanced to explain how TENS controls pain.
1. The Gate control theory centres on the body's ability to regulate pain perception. Pain sensitive receptors (nociceptors) transmit information about the precise nature of the pain and its intensity. There are three types of sensory nerve fibres. The slower conducting non myelinated C fibres only carry pain sensations and are most numerous. The faster conducting A fibres of which there two types are myelinated and other sensations as well as pain. The theory is that all pain information passes through a gate in the substantia gelantosia in the dorsal horn of the spinal cord. Hypersensitation of the painful area by TENS boosts A fibre activity in the peripheral nerves which closes the spinal gate inhibiting transmission of pain sensations to the brain via the C fibres.

2. The theory of endorphin/ encephalin stimulation by TENS. This suggests that TENS acts by stimulating production of the body's natural morphine like substances, the endorphins, the endorphins and the encephalins. These opioids appear to block pain at receptor sites of afferent neurones.

Studies have shown that TENS can be effective in relieving post herpatic neuralgia, backpain, migraine, phantom limb pain and malignancy pain.
Skin reactions can occur.

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*Appendix 14* *Pain Policy*

# XXXXXXX HOSPITAL
# THE MANAGEMENT OF PAIN

## AIM

The aim of pain management is that every effort will be made to relieve pain completely.

## INTRODUCTION

For the majority of patients with acute, chronic and cancer pain, comfort can be achieved with the attentive use of analgesic medication. The outcomes of analgesic treatment can be improved by the ensuring that the occurrence of pain is recognised promptly and that when pain persists, there is rapid feedback to modify treatment. Pain management extends beyond pain relief, encompassing the patient's quality of life and their ability to function in the family and society.
Effective pain management is best achieved by a team approach, involving patients, their families and all health care providers. Pain and its management should be discussed with patients and their families and patients should be encouraged to be active in their care.

## DEFINITION OF PAIN

***"Pain is whatever the experiencing patient says it existing whenever he says it does."*** *M. McCaffrey 1972*

This definition allows for the patient to describe his/her own subjective experience of pain. Patients' pain must be believed regardless of whether the pain is perceived as pain in its own right or as a symptom for expressing other associated issues.

## THE ASSESSMENT OF PAIN

1. Pain should be assessed and documented with regard to intensity, site and duration of pain on admission.
2. Pain should be assessed and documented for each new report of pain and then routinely at regular intervals depending on the severity of pain.
3. The degree of pain relief should be determined after each pain intervention, once sufficient time has elapsed for treatment to take effect.

## THE TREATMENT OF PAIN

Pain should be treated according to the individual needs of the patient. If the analgesia prescribed is not sufficient to keep the patient pain free then the medical team must be asked to review treatment. Non analgesic management of pain should compliment analgesic management. This may include effective occupational and physical therapy. Giving appropriate information to patients and allowing patients to express their fears can be helpful. Relaxation and guided imagery can help distract and relieve a patient's pain.With the Consultants permission counselling may be appropriate. Alternative treatments such as Reflexology and Aromatherapy can be helpful but should not be used without the patient's Consultants permission.

## ANALGESIA

The nurse administering any analgesia must be aware of the length of action and side effects of the analgesia.

*Appendix 15 Pain Conference*

# PAIN CONFERENCE

| | | |
|---|---|---|
| 08.15 | --- Registration --- | |
| 08.50 | Introduction | |
| 09.00 | Opening address | Mary O'Rourke, T.D. |

CHAIRPERSON:- Eadaoin O'Shea, Haemophillia Sister

| | | |
|---|---|---|
| 09.15 | Pain physiology & Pain assessment | Kay Mac Lellan |
| 10.00 | Epidurals & Pt. Controlled Analgesia | Lorna Hynes |
| 11.00 | --- Coffee --- | |
| 11.30 | Pain teams | Sr. Donna Brown |
| 12.30 | --- Lunch & Exhibitions --- | |

CHAIRPERSON:- Kay Mac Lellan

| | | |
|---|---|---|
| 14.00 | Chronic Pain Management | Dr. J. Schnittger |
| 15.00 | Pharmacological agents | Patricia Harrington |
| 16.00 | The holistic approach | Charlotte Brown |
| 16.30 | --- Close --- | |

Category I approval, An Bord Altranais

9th November 1996

*"By any reasonable code, freedom from pain should be a basic human right, limited only by our knowledge to achieve it"*
Liebeskin & Melzack 1987

# *Appendix 16 Multiple Linear Regression Analysis*

**Multiple Linear Regression Models**

| | | |
|---|---|---|
| Set 1 | - | 6 hours |
| Set 2 | - | 18 hours |
| Set 3 | - | 24 hours |
| Set 4 | - | 30 hours |
| Set 5 | - | 46 hours |

Each multiple regression analysis set is reported for the Intervention hospital first and then the Control hospital. The parameter estimates, standard error, t test, p value, confidence interval, $R^2$ adjusted and Analysis of Variance (ANOVA) are reported for each data set.

The coding system used for the factors is described in the Analysis chapter (page 120).

## Set 1: - 6 hours - Intervention hospital

TABLE 1 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 2 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 1: – 6 hours - Control Hospital

TABLE 3 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 4 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 2: - 18 hours - Intervention hospital

TABLE 5 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 6 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 2: - 18 hours - Control hospital

TABLE 7 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 8 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 3: - 24 hours - Intervention hospital

TABLE 9 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 10 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 3: - 24 hours - Control hospital

TABLE 11 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 12 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 4: - 30 hours - Intervention hospital

TABLE 13 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 14 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 4: – 30 hours - Control hospital

TABLE 15 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 16 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 5: - 46 hours - Intervention hospital

TABLE 17 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 18 ANALYSIS OF VARIANCE (ANOVA) TABLE

## Set 5: – 46 hours - Control hospital

TABLE 19 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

TABLE 20 ANALYSIS OF VARIANCE (ANOVA) TABLE

**Set 1: - 6 hours - Intervention hospital**

Table 1 outlines the results of the regression analysis for the intervention hospital of pain scores at 6 hours and gender, morning or evening surgery, operation types, agegroup and period. Table 2 outlines the analysis of variance.

TABLE 1 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 6.3098422 | 0.767947 | 8.22 | <.0001 | 4.7886753 | 7.8310092 |
| SEX[0-1] | 0.3354124 | 0.215706 | 1.55 | 0.1227 | -0.091863 | 0.7626878 |
| AMPM[0-1] | 0.6575224 | 0.536544 | 1.23 | 0.2229 | -0.405276 | 1.7203213 |
| OPTYPE[0-1] | 0.9162015 | 0.24896 | 3.68 | 0.0004 | 0.423057 | 1.4093461 |
| PERIOD[0-1] | 0.2146636 | 0.18984 | 1.13 | 0.2605 | -0.161376 | 0.5907034 |
| AGE1 | -1.550102 | 0.655046 | -2.37 | 0.0196 | -2.847631 | -0.252573 |
| AGE2 | -2.013311 | 0.678824 | -2.97 | 0.0037 | -3.357941 | -0.668681 |

TABLE 2 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 141.07314 | 23.5122 | 5.4168 |
| Error | 115 | 499.17147 | 4.3406 | Prob>F |
| C Total | 121 | 640.24461 | | <.001 |

In this model operation type and agegroup (Age 1 and Age 2) are the factors that are contributing significantly.

122 pain score measures were used in the analysis. The R square adjusted was 0.18. This means that the total variation accounted for by the model was 18%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 1: – 6 hours - Control Hospital**

Table 3 outlines the results of the regression analysis for the intervention hospital of pain scores at 6 hours and gender, morning or evening surgery, operation types, agegroup and period. Table 4 outlines the analysis of variance.

TABLE 3 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 6.4499916 | 0.909397 | 7.09 | <.0001 | 4.6348256 | 8.2651576 |
| SEX[0-1] | 0.4625788 | 0.295412 | 1.57 | 0.1221 | -0.127067 | 1.0522247 |
| AMPM[0-1] | -0.867199 | 0.545517 | -1.59 | 0.1166 | -1.956058 | 0.2216592 |
| OPTYPE[0-1] | 1.0209051 | 0.332616 | 3.07 | 0.0031 | 0.356999 | 1.6848113 |
| PERIOD[0-1] | 0.1684447 | 0.299015 | 0.56 | 0.5751 | -0.428393 | 0.7652828 |
| AGE1 | -0.534064 | 0.861152 | -0.62 | 0.5372 | -2.252932 | 1.1848048 |
| AGE2 | -0.426957 | 0.876778 | -0.49 | 0.6279 | -2.177016 | 1.3231031 |

TABLE 4 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 93.29091 | 15.5485 | 2.8012 |
| Error | 67 | 371.88814 | 5.5506 | Prob>F |
| C Total | 73 | 465.17905 | | 0.0172 |

In this model operation type is the only factor that is contributing significantly.

74 pain score measures were used in the analysis. The R square adjusted was 0.13. This means that the total variation accounted for by the model was 13%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 2: - 18 hours - Intervention hospital**

Table 5 outlines the results of the regression analysis for the intervention hospital of pain scores at 18 hours and gender, morning or evening surgery, operation types, agegroup and period. Table 6 outlines the analysis of variance.

TABLE 5 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 4.3713883 | 0.58667 | 7.45 | <.0001 | 3.2038734 | 5.5389031 |
| SEX[0-1] | 0.3295415 | 0.215679 | 1.53 | 0.1305 | -0.099674 | 0.7587574 |
| AMPM[0-1] | 0.099367 | 0.24472 | 0.41 | 0.6858 | -0.387643 | 0.5863775 |
| OPTYPE[0-1] | 0.6367836 | 0.2446 | 2.60 | 0.0110 | 0.150013 | 1.1235543 |
| PERIOD[0-1] | 0.03417 | 0.216865 | 0.16 | 0.8752 | -0.397407 | 0.4657474 |
| AGE1 | 0.7554248 | 0.680322 | 1.11 | 0.2702 | -0.598464 | 2.1093137 |
| AGE2 | 0.343232 | 0.729734 | 0.47 | 0.6394 | -1.108991 | 1.7954549 |

TABLE 6 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 61.17397 | 10.1957 | 2.5898 |
| Error | 80 | 314.94420 | 3.9368 | Prob>F |
| C Total | 86 | 376.11816 | | 0.0241 |

In this model operation type is the only factor that is contributing significantly.

87 pain score measures were used in the analysis. The R square adjusted was 0.1. This means that the total variation accounted for by the model was 10%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 2: - 18 hours - Control hospital**

Table 7 outlines the results of the regression analysis for the intervention hospital of pain scores at 18 hours and gender, morning or evening surgery, operation types, agegroup and period. Table 8 outlines the analysis of variance.

TABLE 7 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 6.0412274 | 0.56199 | 10.75 | <.0001 | 4.9272586 | 7.1551962 |
| SEX[0-1] | 0.109889 | 0.191031 | 0.58 | 0.5663 | -0.268769 | 0.4885472 |
| AMPM[0-1] | 0.9363672 | 0.203175 | 4.61 | <.0001 | 0.533636 | 1.3390984 |
| OPTYPE[0-1] | 1.0226584 | 0.190196 | 5.38 | <.0001 | 0.6456541 | 1.3996628 |
| PERIOD[0-1] | 0.2090439 | 0.189908 | 1.10 | 0.2734 | -0.16739 | 0.585478 |
| AGE1 | -0.792177 | 0.621798 | -1.27 | 0.2054 | -2.024697 | 0.440342 |
| AGE2 | -1.291901 | 0.619786 | -2.08 | 0.0395 | -2.520433 | -0.063368 |

TABLE 8 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 265.82452 | 44.3041 | 13.3046 |
| Error | 108 | 359.63844 | 3.3300 | Prob>F |
| C Total | 114 | 625.46296 | | <.0001 |

In this model AMPM (whether patients had morning or evening surgery) and operation type are the two factors that are contributing significantly.

The R square adjusted was 0.4. This means that the total variation accounted for by the model was 40%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 3: - 24 hours - Intervention hospital**

Table 9 outlines the results of the regression analysis for the intervention hospital of pain scores at 24 hours and gender, morning or evening surgery, operation types and agegroup and period. Table 10 outlines the analysis of variance.

TABLE 9 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 5.5837927 | 0.588569 | 9.49 | <.0001 | 4.4199273 | 6.7476581 |
| SEX[0-1] | 0.3260575 | 0.222999 | 1.46 | 0.1460 | -0.114912 | 0.7670273 |
| AMPM[0-1] | -0.43791 | 0.274598 | -1.59 | 0.1131 | -0.980914 | 0.1050942 |
| OPTYPE[0-1] | 0.7378271 | 0.249942 | 2.95 | 0.0037 | 0.2435794 | 1.2320749 |
| PERIOD[0-1] | 0.2012266 | 0.202045 | 1.00 | 0.3210 | -0.198307 | 0.60076 |
| AGE1 | -0.457546 | 0.653802 | -0.70 | 0.4852 | -1.750406 | 0.835315 |
| AGE2 | -0.664806 | 0.667074 | -1.00 | 0.3207 | -1.98391 | 0.654299 |

TABLE 10 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 144.47976 | 24.08 | 4.1461 |
| Error | 137 | 795.68517 | 5.8079 | Prob>F |
| C Total | 143 | 940.16493 | | 0.0007 |

In this model operation type is the only factor that is contributing significantly.

144 pain score measures were used in the analysis. The R square adjusted was 0.12. This means that the total variation accounted for by the model was 12%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 3: - 24 hours - Control hospital**

Table 11 outlines the results of the regression analysis for the intervention hospital of pain scores at 24 hours and gender, morning or evening surgery, operation types and agegroup and period. Table 12 outlines the analysis of variance.

TABLE 11 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 6.92741 | 0.696345 | 9.95 | <.0001 | 5.5500556 | 8.3047644 |
| SEX[0-1] | 0.3068803 | 0.243879 | 1.26 | 0.2105 | -0.175508 | 0.7892686 |
| AMPM[0-1] | -0.862784 | 0.228688 | -3.77 | 0.0002 | -1.315125 | -0.410444 |
| OPTYPE[0-1] | 0.4909842 | 0.265485 | 1.85 | 0.0666 | -0.034139 | 1.0161072 |
| PERIOD[0-1] | 0.2920097 | 0.221677 | 1.32 | 0.1900 | -0.146462 | 0.7304813 |
| AGE1 | -1.842714 | 0.744263 | -2.48 | 0.0145 | -3.314851 | -0.370577 |
| AGE2 | -2.310929 | 0.752352 | -3.07 | 0.0026 | -3.799064 | -0.822793 |

TABLE 12 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 212.4513 | 35.4086 | 5.4386 |
| Error | 133 | 865.9062 | 6.5106 | Prob>F |
| C Total | 139 | 1078.3575 | | <.0001 |

The factors AGE1 and AGE2 are the two factors contributing significantly to the model.

140 pain score measures were used in the analysis. The R square adjusted was 0.16. This means that the total variation accounted for by the model was 16%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 4: - 30 hours - Intervention hospital**

Table 13 outlines the results of the regression analysis for the intervention hospital of pain scores at 30 hours and gender, morning or evening surgery, operation types and agegroup and period. Table 14 outlines the analysis of variance.

TABLE 13 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 5.1946829 | 0.885787 | 5.86 | <.0001 | 3.4381238 | 6.9512421 |
| SEX[0-1] | 0.3079093 | 0.257668 | 1.19 | 0.2348 | -0.203059 | 0.8188777 |
| AMPM[0-1] | 0.0322973 | 0.604696 | 0.05 | 0.9575 | -1.166846 | 1.2314402 |
| OPTYPE[0-1] | 0.4128494 | 0.295954 | 1.39 | 0.1660 | -0.174043 | 0.9997414 |
| PERIOD[0-1] | 0.1524876 | 0.223678 | 0.68 | 0.4969 | -0.291078 | 0.596053 |
| AGE1 | -0.452455 | 0.767987 | -0.59 | 0.5570 | -1.975411 | 1.0705015 |
| AGE2 | -1.875298 | 0.809429 | -2.32 | 0.0225 | -3.480435 | -0.27016 |

TABLE 14 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 103.68619 | 17.2810 | 3.1551 |
| Error | 104 | 569.6248 | 5.4772 | Prob>F |
| C Total | 110 | 673.31099 | | .0070 |

In this model agegroup (Age 2) is the only factor that is contributing significantly.

111 pain score measures were used in the analysis. The R square adjusted was 0.1. This means that the total variation accounted for by the model was 10%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 4: – 30 hours - Control hospital**

Table 15 outlines the results of the regression analysis for the intervention hospital of pain scores at 30 hours and gender, morning or evening surgery, operation types and agegroup and period. Table 16 outlines the analysis of variance.

TABLE 15 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 6.1366791 | 0.817024 | 7.51 | <.0001 | 4.5058888 | 7.7674694 |
| SEX[0-1] | 0.5781771 | 0.267508 | 2.16 | 0.0342 | 0.0442282 | 1.112126 |
| AMPM[0-1] | -0.418569 | 0.489109 | -0.86 | 0.3952 | -1.394835 | 0.5576977 |
| OPTYPE[0-1] | 1.1906418 | 0.304674 | 3.91 | 0.0002 | 0.5825088 | 1.7987748 |
| PERIOD[0-1] | -0.512805 | 0.268213 | -1.91 | 0.0602 | -1.048162 | 0.0225522 |
| AGE1 | -0.527617 | 0.772091 | -0.68 | 0.4967 | -2.06872 | 1.0134854 |
| AGE2 | -1.295123 | 0.784164 | -1.65 | 0.1033 | -2.860324 | 0.2700776 |

TABLE 16 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 156.16959 | 36.0283 | 5.8483 |
| Error | 67 | 298.19054 | 4.4506 | Prob>F |
| C Total | 73 | 454.36014 | | <.0001 |

In this model sex and operation type are the two factors that are contributing significantly.

74 pain score measures were used in the analysis. The R square adjusted was 0.29. This means that the total variation accounted for by the model was 29%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 5: - 46 hours - Intervention hospital**

Table 17 outlines the results of the regression analysis for the intervention hospital of pain scores at 46 hours and gender, morning or evening surgery, operation types and agegroup and period. Table 18 outlines the analysis of variance.

TABLE 17 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 5.8114006 | 1.637479 | 3.55 | 0.0006 | 2.5561846 | 9.0666166 |
| SEX[0-1] | 0.2638539 | 0.305811 | 0.86 | 0.3906 | -0.344081 | 0.8717884 |
| AMPM[0-1] | -0.273871 | 0.310255 | -0.88 | 0.3798 | -0.890641 | 0.3428992 |
| OPTYPE[0-1] | 0.4975467 | 0.346241 | 1.44 | 0.1543 | -0.19076 | 1.1858532 |
| PERIOD[0-1] | -0.161936 | 0.237595 | -0.68 | 0.4973 | -0.634262 | 0.3103896 |
| AGE1 | -1.30616 | 1.663049 | -0.79 | 0.4344 | -4.612207 | 1.9998876 |
| AGE2 | -1.164521 | 1.676226 | -0.69 | 0.4891 | -4.496764 | 2.1677212 |

TABLE 18 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 69.94042 | 11.6567 | 2.2781 |
| Error | 86 | 440.04746 | 5.1168 | Prob>F |
| C Total | 92 | 509.98788 | | 0.0434 |

In this model no factors are contributing significantly. 93 pain score measures were used in the analysis.

The R square adjusted was 0.08. This means that the total variation accounted for by the model was 8%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.

**Set 5: – 46 hours - Control hospital**

Table 19 outlines the results of the regression analysis for the intervention hospital of pain scores at 46 hours and gender, morning or evening surgery, operation types and agegroup and period. Table 20 outlines the analysis of variance.

TABLE 19 MULTIPLE LINEAR REGRESSION ANALYSIS OF PAIN SCORES AT 6 HOURS AND SEX, AMPM, OPERATION TYPE, PERIOD, AGEGROUP AND TIME

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 4.7353837 | 0.93487 | 5.07 | <.0001 | 2.8783708 | 6.5923965 |
| SEX[0-1] | 0.1213904 | 0.250917 | 0.48 | 0.6297 | -0.377027 | 0.6198079 |
| AMPM[0-1] | -0.754927 | 0.245124 | -3.08 | 0.0027 | -1.241838 | -0.268017 |
| OPTYPE[0-1] | 0.8673803 | 0.261652 | 3.32 | 0.0013 | 0.3476381 | 1.3871224 |
| PERIOD[0-1] | 0.9376259 | 0.241744 | 3.88 | 0.0002 | 0.4574283 | 1.4178235 |
| AGE1 | -0.604438 | 0.971487 | -0.62 | 0.5354 | -2.534187 | 1.3253102 |
| AGE2 | -0.407891 | 1.002703 | -0.41 | 0.6851 | -2.399648 | 1.5838657 |

TABLE 20 ANALYSIS OF VARIANCE (ANOVA) TABLE

| Source | DF | Sum of Square | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 6 | 179.05484 | 29.8425 | 5.9044 |
| Error | 91 | 459.93956 | 5.0543 | Prob>F |
| C Total | 97 | 638.99440 | | <.0001 |

In this model AMPM, operation type and period are the three factors that are contributing significantly.

98 pain score measures were used in the analysis. The R square adjusted was 0.23. This means that the total variation accounted for by the model was 23%. The ANOVA table shows that the F test is significant which means that at least one of the regression factors in the model is significant.