Chapter 1

Introduction

Background
Throughout history, pain has been depicted as a phenomenon that has mystified and intrigued philosophers as well as physicians for thousands of years. Whilst the vocabulary of pain always suggests a negative event or an unpleasant experience, pain can play a positive role in daily life. In basic biological terms, pain is a protective mechanism meant to protect against tissue damage. Initially, this type of pain is instant and intense but short-lived and usually signals 'danger'. Such pain is a learning experience, which will hopefully result in avoidance of the particular source of danger in the future. Later, the pain may be less intense but dull in nature, ensuring that the body part is rested and protected from further abuse, allowing time for healing to occur.

This explanation, however, clearly does not account for instances where pain serves no useful purpose or where pain comes too late to be helpful. For example, limb amputees will often still feel pain in the amputated limb. This pain is not only distressing, but serves no useful purpose to the patient and the pain, as opposed to the disease, will require treatment. Physiologically, we may be able to explain why this happens, however, such pain is not only unhelpful, having no positive role, but can also be detrimental (Hawthorn & Redmond, 1998).
Pain after surgery can be considered to have a positive role, restricting excessive movement of the affected area and allowing healing to occur. However, it is generally accepted that unrelieved pain can also be detrimental to healing, causing patients to resist mobilisation, which can result in complications such as deep vein thrombosis (DVT) and chest infection, and can cause depression and loss of morale (Hawthorn & Redmond, 1998). In addition to the immobilising effects of pain, activation of the neuroendocrine system also occurs, resulting in what has been termed the ‘stress response to injury’ (Sinatra et al., 1992). This response is characterised by an increased secretion of catabolic hormones (cortisol, glucagon, growth hormone, catecholamines) and inhibition of anabolic mediators, particularly insulin and testosterone (Chernow et al., 1987). The resultant alterations in hormone secretion are meant to provide short-term benefits of enhanced energy production. However, when amplified or prolonged, catabolic effects of the stress response may adversely affect postsurgical outcome through excessive protein loss and diminished synthesis of immunoglobulins, resulting in impaired immunocompetence (Sinatra et al., 1992). Pathophysiologic changes associated with increased release of catecholamines result in increased sympathetic tone and altered regional perfusion. As a consequence, increased peripheral vascular resistance (afterload) is experienced, resulting in increased myocardial contractility and oxygen consumption and redirection of blood flow to high-priority organs (and hence, diminished blood flow to injured tissues). These changes are responsible for an increased incidence of postsurgical hypertension, ranging from 5% after minor, uncomplicated procedures to approximately 50% in patients recovering from more extensive surgery (Sinatra et al., 1992). Increases in oxygen consumption, although generally well tolerated in
younger persons, have been shown to precipitate myocardial ischaemia in patients with coronary artery disease (Tarhan et al., 1972).

In addition to adverse physiological effects, unrelieved pain has been shown to result in a wide range of emotional reactions, including anxiety and fear, depression, irritability and anger ((Hawthorn & Redmond, 1998) (Marks & Sachar, 1973). Lander (Lander, 1990a) suggests that uncontrolled and repetitive pain has the capacity to provoke conditioned avoidance responses, which may be the origin of dysfunctional behaviour in which individuals avoid health care. Therefore, whilst the role of pain is both beneficial and detrimental, pain after surgery is considered to have a negative role in the healing process.

The incidence of undertreated postoperative pain was first reported by Marks and Sachar (Marks & Sachar, 1973) in what has come to be considered a classic report on the management of pain in hospitalised patients. Although some of their patients suffered chronic rather than acute pain, this evaluation has provided a background against which nearly three decades of advances have been compared. In their study, 37 patients receiving pethidine for pain were asked to rate their relative level of distress. Seventy-three percent of the study participants rated their pain as moderate to severe. Sadly, despite improvements in modern techniques of pain control and significant advances in postoperative pain management (due in part to a greater understanding of physiologic and pharmacologic relationships to pain as well as improvements in drug delivery technology) the relief of postoperative pain remains unsatisfactory. More recent studies indicate that undertreatment of pain continues to be a problem for postsurgical patients, with up to 75% of patients continuing to experience moderate to severe pain (Cohen, 1980) (Donovan, 1983) (Kuhn et al.,

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Important variables that affect the treatment of postoperative pain include both sociodemographic and clinical variables. Sociodemographic variables which have been associated with differences in analgesic consumption include patient age (Macintyre & Jarvis, 1995) gender (Bendelow, 1993; Calderone, 1990) (Ellermeier & Westphal, 1995) (McDonald & Bridge, 1991) (Vallerand, 1995) and culture or ethnicity (Todd et al., 1994) (Todd et al., 1993) (Vangen et al., 1996). Whilst the effects of age and gender on analgesic consumption have been studied in some detail, the relationship between culture or ethnicity (more recently referred to as cultural and linguistic diversity), and the treatment of pain in the clinical setting is not so apparent. What is evident is that patients who are unable to communicate because of language difficulties will be at a particular disadvantage when it comes to obtaining adequate pain relief. However, the influence of cultural diversity, which goes beyond language, on pain management is not so evident. The exact reasons for undertreatment of pain in patients from linguistic and culturally diverse backgrounds remains unclear. Some studies have suggested that differences in pain perception and expression exist both between cultural or language groups (referred to as inter—group differences) and within specific language and cultural groups (referred to as intra group differences) (Bates et al., 1993) (Douglas, 1995); (Faucett et al., 1994) (Greenwald, 1991) (Houghton et al., 1992) (Martinelli, 1987). These differences are likely to affect analgesic requirements. However, the majority of studies are ambiguous as to whether differences in analgesic consumption stem from differences in pain behaviour of the patients or differences in medical staff's perception and
treatment of such patients (McDonald, 1994) Ng, Dimsdale, Rollnik, & Shapiro, 1996a; Ng, Dimsdale, Shragg, & Deutsch, 1996b; (Todd et al., 1994)

Clinical variables have also been shown to affect the consumption of postoperative analgesia. The most important of these variables include the route of analgesic administration (Egbert et al., 1990) (Jackson, 1989) (McGrath et al., 1989) (Snell et al., 1997b) (Wasylak et al., 1990), length of procedure and site of operation (Preble et al., 1990), and preoperative morbidity (Hall & Hall, 1996).

Regardless of the cause of differences in analgesic consumption, a National Health and Medical Research Council (NH&MRC) Report (National Health and Medical Research Council, 1998) has identified patients from different ethnic groups as particularly at risk of receiving inadequate pain relief.

The South Western Sydney Area Health Service (SWSAHS), the location for this study, has the largest non-English speaking background (NESB) population of any Area Health Service in NSW, Australia (South Western Sydney Area Health Service, 1995). In recent years, the NESB population of SWSAHS has increased at three times the rate of the general population, with a resultant 24.5% increase in hospital utilisation (South Western Sydney Area Health Service, 1995). This increase in hospital utilisation includes an increase in surgical services and consequently, an increase in the need for satisfactory postoperative analgesia.

Although more than 200 articles have been published describing the relationship between cultural and linguistic diversity and pain (Ng et al., 1996), no Australian study of postoperative pain management in different cultural and ethnic groups has
been reported. This represents a serious gap in the knowledge required for the effective management of postoperative pain in a culturally diverse population.

**Significance**

Unrelieved postoperative pain, as previously discussed, can result in adverse physiological and psychological changes affecting all major organ systems (Lander, 1990a). Although a variety of factors may contribute to the development of postoperative complications, responses to poorly controlled pain play a prominent role and have been shown to increase morbidity and mortality (Sinatra et al., 1992).

Whilst unrelieved pain is acknowledged to have a detrimental effect on a patient's physical and psychological function, the full clinical and economic effects are not known. It is estimated that in an Australian society, the financial costs associated with severe, unrelieved pain may be as high as AU $10 billion a year (National Health and Medical Research Council, 1998).

Numerous studies have demonstrated decreased morbidity and mortality in patient groups receiving superior forms of analgesia (epidural/spinal) as opposed to patients receiving analgesia on an 'as needed' basis ((Pflug et al., 1974) (Tuman et al., 1991). In addition, studies supporting a decreased length of stay and decreased hospitalisation costs have been reported in patients receiving analgesia via the Patient Controlled Analgesia (PCA) route as compared to patients who received analgesia by conventional means (Wasylak et al., 1990)). Jacobs (Jacobs, 1987) demonstrated a saving of over US$200,000 from a reduction in hospital bed usage by 47 patients.

With greater emphasis on evidenced-based practice and outcomes management, it is becoming increasingly important to provide evidence that optimal postoperative pain
management can have a significant influence on postsurgical morbidity and hospital economics.

Exploration of the determinants of analgesic consumption in postsurgical patients with special needs, may result in a reduced length of hospitalisation and a reduction in postoperative morbidity. In addition, information gained from this study will assist in planning for postsurgical (acute) pain services to meet the needs of a rapidly increasing NESB population.

This research seeks to explore the administration and consumption of postoperative analgesia in culturally and linguistic different groups. In addition, the issue of linguistic diversity or being from a non-English speaking background, will be compared with other sociodemographic and clinical factors, to compare their relative influence on analgesic administration and consumption. An explanatory model of postoperative analgesic consumption will be developed based on key identified factors.
Aims
This study seeks to:

a) Explore the influence of language on the nature and type of analgesia received by linguistically-diverse surgical patients; and
b) Develop and test a comprehensive model, which incorporates sociodemographic (inclusive of linguistic and cultural diversity) and other important clinical factors, to predict analgesic consumption in surgical patients.
Chapter 2

Literature Review

Few experiences in life are more universal than pain, which “flows like lava beneath the crust of daily life” (Brand, 1993), p.12. J.K. Huysmans called it a “useless, unjust, incomprehensible, inept abomination” (Brand, 1993). It has been immortalised by poets, from Shakespeare to Keats, whilst those who have suffered at its hand would almost certainly agree with neurologist Russell Martin when he states “Pain is greedy, boorish, meanly debilitating. It is cruel and calamitous and often constant, and, as its Latin root poena implies, it is the corporeal punishment each of us ultimately suffers for being alive” ((Brand, 1993), p.13). For good or for ill, the human species has among its ‘privileges’ the preeminence of pain.

Whilst poets have attempted to capture the essence of pain, scientists have been proposing theories to explain this complex sensation. In 1664, Descartes described nerves as tubes composed of large numbers of fine threads that functioned to connect the brain with the skin and other tissues (Morris, 1991). In 1840, Müller expanded this concept through his “Doctrine of Specific Nerve Energies”, which proposed that the brain received information about external objects and body structures via sensory nerves for each of the five senses (sight, smell, taste, hearing and touch) (Sinatra et al., 1992). At this time, pain was not considered to be a distinct sensation, but a component of the sense of touch.
In 1884, Blix (Sinatra et al., 1992) demonstrated that stimulation of separate, localised points on the skin produced distinct sensations of touch, warmth, cold or pain. For example, a cold spot could be stimulated by cold, but not heat. This was a significant discovery, for it resulted in histologists confirming that the sensation of pain was correlated with stimulation of free nerve endings – termed ‘nociceptors’. In other words, stimulation of ‘pain receptors’ resulted in the sensation of pain.

Other theories emerged over the next century, but it was the gate-control theory, proposed by Melzack and Wall in 1965, that proved a watershed in the way people thought regarding the transmission of pain. This theory proposed that the transmission of pain was modulated by input from the periphery (afferent input), descending inhibitory systems, and cognitive and emotional factors. Whilst aspects of the gate-control theory, as originally proposed, have been challenged (Sinatra et al., 1992), the concept that the transmission of pain can be modulated by central and peripheral mechanisms remains intact, and is wholly supported by clinical and experimental evidence.

This chapter presents accepted definitions of pain and distinguishes between the various types of pain. It provides a basic foundation in the physiology and pathophysiology of pain and the consequences of unrelieved pain. Factors affecting the severity of postoperative pain are presented and barriers to effective pain management discussed. The impact of patient cultural and linguistic diversity, or ethnicity on each of these aspects is addressed.
Definitions Of Pain

The most widely accepted definition of pain, adopted by the International Association for the Study of Pain (IASP) and the Australian Pain Society (APS), is "Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Ready & Edwards, 1992). This definition of pain acknowledges the multiple components of the pain experience, that is, the physical and emotional aspects of pain. In addition, the complexity of the pain experience is evidenced in the reference to pain occurring in the absence of tissue damage. In fact, there is no predictable relationship between identifiable tissue injury and the sensation of pain, with some descriptions of pain being disproportionate to the degree of tissue damage (McCaffery & Pasero, 1999).

Because pain is such a personal experience, a more clinically useful definition is Margo McCaffery’s definition that states “Pain is whatever the experiencing person says it is, existing whenever he says it does” (McCaffery, 1997).
The Physiology Of Pain

In physiological terms, there are two separate pain phenomena. The first is the pain that results from intense or potentially damaging stimuli (the pinprick). Termed nociceptive (nociceptive derives from the Latin word nocere meaning ‘to hurt’), or physiological pain, this pain is produced by stimulation of specialised pain-sensitive receptors (nociceptors). The second type of pain, termed pathological pain, usually results from nerve or tissue damage and is characterised by interference with the normal mechanisms that underlie pain transmission. Pain may arise in the absence of an obvious stimulus (e.g. phantom limb pain), in response to innocuous stimuli, or in a prolonged or exaggerated fashion (e.g. spinal “wind-up”).

Understanding the physiology of pain, therefore, allows insight into the common causes of pain and its treatment, particularly analgesic medications. In addition, the enormous variability in the perception and expression of pain can be appreciated when an understanding of the physiologic mechanisms exists.
Physiological pain
The perception and interpretation of an event as being painful depends on the functioning of higher brain centres. As a result, ‘pain’ as such does not exist unless it is interpreted by the central nervous system. Because processes occurring in the periphery do not, by themselves, constitute pain, the terms ‘nociceptive receptors’ and ‘nociceptive pathways’ are used (in preference to pain receptors and pain pathways).

The physiologic mechanisms involved in the pain phenomenon are termed nociception. Nociception can be divided into four stages (Copstead & Banasik, 2000):

- transduction – is the process of converting painful stimuli into neuronal action potentials at the sensory receptor (nociceptor);

- transmission – refers to the movement of action potentials along neurons that make their way from the peripheral receptor to the spinal cord and then centrally to the brain;

- modulation – where the message is modified by other activity in the body, which may be activity of other peripheral nerves or activity in the CNS; and

- perception – which occurs when the brain becomes aware of pain signals and interprets them as painful.

It is clinically useful to conceptualise pain physiology according to these four processes because each stage provides an opportunity for intervention in the pain experience. For example, during the process of transduction, noxious stimuli may directly damage nerve endings or result in the release of potent chemical mediators at the site of injury. These chemicals, which include potassium and hydrogen ions, bradykinin, serotonin, histamine, substance P and prostaglandins, influence the membrane potential of the pain receptor, and if depolarisation is sufficient, the

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nociceptor will produce action potentials. When these impulses are conducted centrally, transmission occurs. Knowledge of the chemicals involved in the first stage of nociception can be utilised clinically, by administering drugs that inhibit the release of these chemicals. The most clinically useful drugs are the nonsteroidal antiinflammatory drugs (NSAID's) (McQuay, 2000), which prevent the production of one of these chemical mediators - prostaglandins. Prostaglandins are known to lower the threshold of nociceptors, so that previously painless stimuli become pain producing.

An understanding of the process of transmission has been equally useful in the management of pain. Anaesthetists employ a range of techniques and drugs to interrupt the transmission of nerve impulses along these pathways. Regional analgesia techniques are being used with increasing frequency in the clinical setting to achieve effective analgesia. These techniques block the transmission of pain impulses at the nerve axon, preventing further transmission of impulses to the brain. This may be either peripherally (e.g. wound infiltration, nerve and plexus) or centrally (e.g. spinal).

Similarly, the processes of perception and modulation can be modified to produce analgesia. Pain perception can be described in terms of pain threshold and pain tolerance. Pain threshold refers to the point at which pain is first experienced, that is, the lowest level of potentially injurious sensation that produces a report of pain (McGuire, 1998). There is generally little variation between individuals in terms of pain threshold ((Chakour et al., 1996)(McGuire, 1998). Tolerance is the point at which an individual reports pain to be so intense that it can no longer be tolerated (Buxton et al., 1993); (McGuire, 1998). The literature supports a wide variation in
pain tolerance (Bates et al., 1993); (Ellermeier & Westphal, 1995) & Feine, Bushnell, Miron, & Duncan1991) with age, gender, ethnicity, environmental factors and previous pain experience being particularly influential (Bendelow, )1993; (Camp, 1988); (Williams & Thorn, 1989). It is this diversity in pain tolerance that primarily accounts for the significant variation in analgesic consumption seen in the clinical setting (Burns et al., 1989). Practices which therefore modulate threshold (local anaesthetic agents) or tolerance (opioids) can alter the perception of pain. Other non opioid drugs (e.g. antidepressants, anticonvulsants) are also being used to modulate the perception of pain (Sinatra et al., 1992)(Wall & Melzack, 1994).

Pathological pain
As previously noted, pathological pain is characterised by a disruption of normal sensory mechanisms. It does not involve an early warning system and is almost always associated with tissue damage or damage to the nervous system (Astra Pharmaceuticals, n.d.). Prolongation of the painful stimulus, such as that during and following surgery, results in modification of the threshold of nociceptors. This leads to increased pain with any subsequent stimulation, and expansion of the ‘receptive field’. Unless checked, these processes often lead to spontaneous pain (Astra Pharmaceuticals, n.d.). Because these processes are most likely to occur following injury to nociceptors, as occurs during surgery, they have particular clinical relevance, often resulting in persistent, post-surgical pain.
Within the periphery, tissue injury leads to the release of endogenous algogenic ("pain producing") chemicals. Potassium ions, prostaglandins, bradykinins, hydrogen ions, histamine, noradrenaline, serotonin and other chemicals cause vasodilation, inflammation and oedema (Sinatra et al., 1992). This "chemical soup" (Astra Pharmaceuticals, n.d.) alters the sensitivity of nociceptors, causing primary hyperalgesia (increased response to painful experience). Allodynia (non noxious stimulus interpreted as noxious) may also occur.

Following activation of nociceptors in the periphery, impulses travel toward the central nervous system (CNS) by different types of afferent neurons that can be classified by their size, degree of myelination and conduction velocity (Astra Pharmaceuticals, n.d.). Generally, small, myelinated A-delta fibres and unmyelinated C fibres carry noxious impulses to the dorsal horn of the spinal cord (Hawthorn & Redmond, 1998). Their termination in the dorsal horn activates several ascending pathways that, in turn, activate specific areas of the brain. Pain behaviour (e.g. flinching, crying, immobilisation) is a direct consequence of this process (Astra Pharmaceuticals, n.d.). Damage to these fibres (e.g. during an operation) can result in a variety of anatomical, physiological and biochemical changes (National Health and Medical Research Council, 1998) that are thought to be responsible for many of the pathophysiological responses associated with surgery (Sinatra et al., 1992). Such responses often incite pathologic changes that may adversely affect postoperative outcome, particularly in high-risk patient populations (Breslow, 1990).
Postoperative pain
Because surgical procedures result in an enormous insult to nociceptive (pain) pathways, the physiological events of pain are affected. The central nervous system is inundated with afferent input, which commonly results in a hyperexcitability of the system (Hawthorn & Redmond, 1998). This results in pain that is significantly greater and often elicited more readily.

Postoperative pain is often classified as acute in nature, although studies have demonstrated that if managed poorly, postoperative pain may progress to chronic postoperative pain (Bach et al., 1988)(Katz et al., 1996). The International Association for the Study of Pain (IASP) defines acute pain as:

Pain of recent onset and probable limited duration. It usually has an identifiable temporal and causal relationship to injury or disease. This is in distinction to chronic pain which is defined as pain lasting for long periods of time (which) commonly persists beyond the time of healing of an injury and frequently there may not be any clearly identifiable cause (Ready & Edwards, 1992).

Factors affecting the severity of postoperative pain
Some factors have been identified as affecting the intensity and duration of postoperative pain, as well as the safety and effectiveness of analgesic therapy (Sinatra et al., 1992). The most important of these include age, culture or ethnicity, gender, personality, the nature of surgery and opioid pharmacodynamics. In contrast, differences in body weight and variabilities in opioid pharmacokinetics appear to have less influence upon overall analgesic requirements.

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Age

Age appears to be the most important variable in determining the degree of pain relief experienced after administration of opioids. Advancing age typically alters opioid dose response, with a negative correlation between age and postoperative opioid consumption commonly observed.

Early work by Belville, Forest and Miller (Belville et al., 1971) demonstrated significant age related improvements in analgesic response (superior pain relief scores) to fixed doses of morphine (10mg) and pentazocine (20mg) in male patients aged 30 to 70 years. Kaiko (Kaiko, 1980) reported significant age-related differences in morphine requirements, noting a strong correlation between increasing age and both duration and efficiency of pain relief. Macintyre and Jarvis (1995) examined the records of 1010 patients aged 15-70 years (mean age 48.7 years) to see what factors might best predict the amount of morphine used in the first 24 hours after surgery. They concluded that the best predictor of morphine requirement was the age of the patient (Macintyre & Jarvis, 1995).

Changes in morphine requirements may be explained in part by age-related pharmacokinetic and pharmacodynamic factors. As age increases, reductions in volume of distribution and clearance of drugs (including opioids) occurs, resulting in higher plasma levels and a longer duration of action. Austin, Stapleton and Mather (1980a) and Tamsen, Hartvig and Fagerlund (1982) noted plasma concentrations of meperidine (pethidine) to be twofold higher in elderly patients when compared to young. In addition to changes in volume of distribution and clearance, a decrease in serum albumin occurs, resulting in a greater unbound fraction of the drug ((Berkowitz et al., 1975); Owen, Sitar, Berger, Brownell, Duke, & Mitenko1983). It
has been suggested that aging may also cause functional changes in peripheral pain pathways (i.e. myelinated (A delta) and unmyelinated (C) primary afferent fibres). A study by Chakour et al., (Chakour et al., 1996) attempted to independently assess age-related changes in the function of A delta and C-nociceptive fibres by examining CO₂ laser-induced thermal pain thresholds before, during and after a compression block of the superficial radial nerve in 15 young and 15 healthy elderly adult subjects. The findings demonstrated a significant difference in the way young and elderly respond to noxious stimuli and confirmed the existence of increased pain thresholds (i.e. decreased pain sensitivity) in older adults.

**Gender**
The effect of gender upon postoperative opioid requirements is by no means as clear as the effect of age. However, there seems to be general agreement that male and female subjects differ in their responses.

Early investigations demonstrated sex-related differences in pain perception and expression ((Bond & Pilowsky, 1966), with men being reported to have a higher pain threshold and pain tolerance than women (Leon, 1974); (Otto & Dougher, 1985)). However, gender differences in pain tolerance and pain threshold have primarily been identified during experimentally-induced pain (Ellermeier & Westphal, 1995), which may differ from procedure-induced clinical pain. Few investigators have studied gender effects of pain in the clinical setting. It has been suggested that pain in clinical populations differs from experimental pain (Scott et al., 1983). Clinically-induced pain is described as longer in duration and of greater intensity than experimental pain. In addition, concerns about death or disability often accompany clinical pain (Lander et al., 1989).
In a study examining the frequency of pain and sedative medication administered to postoperative coronary artery bypass graft patients Calderone (Calderone, 1990) demonstrated that male patients were administered pain medication significantly more frequently than female patients. McDonald (McDonald, 1994) reviewed the medical records of 101 male and 79 female adult appendicectomy patients and found that male patients received significantly larger initial doses of opioid analgesics than female patients although this difference disappeared in the total dose of narcotic analgesic received in the postoperative period. Studies asking nurses to make decisions based on vignettes have demonstrated that nurses would medicate men with more narcotic analgesics than women (Cohen, 1980); (McDonald & Bridge, 1991).

The introduction of patient-controlled analgesia (PCA) has provided a unique opportunity to reassess factors thought to influence the provision of analgesia, although there is little consistency in the findings. Two small studies using PCA with morphine and pethidine found no significant differences between the analgesic requirements of males and females ((Monk et al., 1990), although (Burns et al., 1989) noted a significantly greater 24 hour morphine consumption by males than females.
Ethnicity

Some studies have addressed the effect of patient ethnicity on pain management and nurses’ decisions to intervene. In what has come to be regarded as one of the classic studies linking culture and pain, Zbrowski (1952) described the pain response patterns of males in four cultural groups—“Old Americans” (Anglo-Saxon origin, usually of Protestant creed), Italians, Jews and Irish. Nurses preferred the Old American tradition in which patients described their pain, but did so without emotion.

In an early study by (Davitz et al., 1976) Asian nurses inferred greater pain than American nurses when asked to judge the physical pain of patients presented as vignettes. (Streltzer & Wade, 1981) analysed the variance in postcholecystectomy opioid requirements by racial group in a multiethnic setting. Caucasians and Hawaiians received significantly more analgesics than Filipinos, Japanese, or Chinese. Patients’ presentation of pain may also be affected with some cultures strongly valuing a stoic reaction to pain (Douglas, 1995).

Considerable debate exists about how ethnicity should be discussed and examined within research. In particular, what is the best way to represent a specific cultural or linguistic group is central to the arguments. Investigators often use the term ‘race’ when they mean ‘ethnicity’. Race may be an important feature, but it is not the same thing as ethnicity (Osborne & Feit, 1992). Ethnicity should be differentiated from race, which in the biological sciences means one of the divisions of humankind as differentiated by physical characteristics (e.g. skin colour) (Senior & Bhopal, 1994). Attempts to use racial categories (e.g. white, black, Hispanic) often results in the lumping of distinct ethnicities (Todd, 1996), therefore, the most precise definition of
ethnicity that is practical within a study sample should be made. Todd (1996) suggests determination of ancestral origin will often reveal a wide variety of ethnicities in what was considered a single entity.

Ethnicity is derived from a Greek work meaning a people or tribe. The concept of ethnicity is complex and difficult to define, but it implies one or more of the following: shared origins or social background; shared culture and traditions that are distinctive, maintained between generations, and lead to a sense of identity and group; and a common language or religious tradition (Senior & Bhopal, 1994).

Ethnicity is usually dependent on the context in which the definition is made. For example, children born in Australia of Vietnamese parents are members of their parents’ ethnic group but may perceive themselves part of a larger ethnic group such as Asian. They may also perceive themselves to have an additional ethnic identity relating to their host country (such as Australian).

Ethnicity is a socially constructed phenomenon, with indistinct and constantly changing boundaries. As such, the definition of ethnicity must be made explicit before research can be done and therefore, the definition will vary according to the requirements of the research.

(Fong & Gibbs, 1995) suggest using the term ‘minorities’ serves to disempower, by implicitly setting up the Anglo-European majority group as the standard. They suggest appropriate terms to use include ‘underrepresented’, multicultural’, bicultural/bilingual’ and ‘ethnically/culturally diverse’ to refer to persons of colour or linguistic diversity. ‘Dominant culture settings’ could refer to mainstream services.
However, this information is not generally available from patient’s medical records. For the purpose of this study, ethnicity was determined by the language spoken at home, as this has been found to closely approximate the degree of acculturation toward the dominant culture ((Deyo et al., 1985).

Language spoken at home remains an important, and extensively used, indicator of cultural and or linguistic diversity.

*Site and duration of surgery*

The operative site, degree of surgical manipulation and duration of surgery may dramatically influence both the intensity of postoperative pain and analgesic requirements (Sinatra et al., 1992). Thoracotomies, upper abdominal procedures, and nephrectomies are among the most painful forms of surgery, whereas patients recovering from more superficial procedures require lower doses of analgesia (Carpenter, 1997). A study by (Ng et al., 1996)a) examined the records of 250 patients hospitalised for open reduction and internal fixation of a limb fracture. Operative time was found to be the only significant predictor of total analgesic use (p<.001).

Surgical procedures performed in smaller, district hospitals are, in general, completed faster and with less surgical trauma than comparable operations performed in major hospitals with resident teaching programs (Sinatra et al., 1992). In addition, major teaching hospitals tend to perform more complicated and lengthy procedures, which may help explain why postoperative pain scores and analgesic requirements are generally higher in patients admitted to teaching hospitals (Sinatra et al., 1992).
Mode of Administration – Patient Controlled Analgesia (PCA) and Intermittent Intramuscular Injection (IMI).

Potent opioid analgesics remain the mainstay for treatment of moderate to severe postoperative pain. These drugs are traditionally administered on a PRN (or as-needed) basis by intramuscular injection (IMI) (oral or intravenous routes may also be used). Although commonly used, the intramuscular route is a particularly poor choice for postoperative pain management (McCaffery & Pasero, 1999).

Administration is painful and chronic IM administration can result in sterile abscess formation and fibrosis of muscle and soft tissue. A decreased muscle mass seen in the elderly and fear of injections by children contribute to its disadvantages (McCaffery & Pasero, 1999).

Perhaps more significant are the problems associated with achieving therapeutic concentrations with drugs administered via the intramuscular route. To achieve optimal analgesic benefit, drug concentrations in the plasma and CNS must be maintained within a narrow, therapeutic window. To achieve this, opioids need to be administered by either continuous infusion or as multiple small doses. Intramuscular dosing is typically on an every-4-hour, as-needed schedule, which produces wide variation in drug concentration. This results in patients experiencing cycles of pain–analgesia-sedation. (Graves et al., 1983)) describe a similar “pain cycle” that is dependent on nursing variables (response to patient complaint, “screening”, preparation of the injection, and administration of the injection) and patient characteristics (absorption from administration site, pharmacokinetics and pharmacodynamics).
The effects of opioids administered by the intramuscular (IM) route have been shown to vary widely in different individuals, and within the same individual (Austin et al., 1980b). IM administration of pethidine has been shown to result in as much as a fivefold difference between individuals in the time to reach peak concentration. In addition, a twofold difference within individuals has been demonstrated, depending on the time of day (Austin et al., 1980a).

If the IM route is used, the site of the injection can influence the onset of analgesia, with injection into a well-perfused muscle like the deltoid providing a faster and higher plasma level than injection into a less well-perfused muscle like the gluteal (Kirkpatrick et al., 1988); (McCaffery & Pasero, 1999). In clinical practice, however, the deltoid muscle is infrequently used, due to its close proximity to major nerves and blood vessels and inability to tolerate large volumes.

Patient-controlled analgesia (PCA) is a form of therapy that allows patients to treat pain by self-administering small doses of analgesics. Although the literature (and this discussion) focus on the intravenous route, alternative routes are being used with increasing frequency. These include epidural PCA, sublingual PCA, oral PCA and subcutaneous PCA (Williams, 1996).

A PCA infusion pump delivers a prescribed amount of opioid, usually intravenously, when the patient depresses a button connected to the pump. A ‘lockout interval’ is programmed into the machine, which prevents administration of a second dose until the first dose has had time to exert its effect. These systems operate under three assumptions (Sinatra et al., 1992). The first assumption is that side effects of opioids occur at higher brain concentrations than those needed to produce analgesia. As a
result, excessive use of PCA will result in unpleasant side effects (e.g. nausea and vomiting) with no increase in analgesia.

The second assumption is that pain intensity varies. Patients are more likely to experience postoperative pain with movement or coughing and during the night (postoperative pain appears to have a circadian rhythm). Use of PCA therefore allows patients to increase opioid dose when it is needed and reduce the dose when it is not needed.

The third assumption underlying the operation of PCA systems is that pain relief lies within a very narrow plasma concentration range, which is subject to individual variation Austin, Stapleton & Mather (1980b). To maintain this range, small doses need to be administered frequently. PCA allows patients to deliver small doses of opioid frequently, thus maintaining an effective plasma concentration.

Results of early comparisons of PCA with traditional intermittent intramuscular dosing indicated that not only was PCA a superior form of analgesic therapy, but also the improved pain control was achieved with a lower total dose of opioid medication (Bennett et al., 1982) (Hecker & Albert, 1988)(Lange et al., 1988)). Subsequent studies have provided conflicting findings, with some suggesting PCA is no more effective than other methods of systemic opioid administration after surgery (National Health and Medical Research Council, 1998) (Sinatra et al., 1992); (Yeager et al., 1987). Where PCA has been compared with intramuscular injections on an ‘as needed’ basis, pain relief with PCA is significantly better than that with intramuscular injections, even though both methods result in patients receiving a similar amount of drug (Wasylak et al., 1990). In studies by (Sinatra et al., 1992)
and (Owen et al., 1986), the authors noted that more analgesic was used in the PCA group. Interestingly, Owen, et al (1986) found that morphine doses in excess of 100mg/24 hours post-operatively, by PCA were not rare.

Whilst it is generally accepted that PCA has the capability of providing continuous analgesia, suited to individual requirements and with minimal sedation, there is little evidence in terms of patient outcomes as to the effectiveness of PCA versus IM analgesia (Williams, 1996). (Snell et al., 1997b) assessed the efficacy and postoperative outcomes of intravenous PCA compared to intramuscular (IM) injections in 73 patients who underwent major abdominal surgery. Results of the study did not demonstrate a statistically significant difference in amount of pain, amount of analgesia, degree of patient satisfaction with pain control, length of time to first ambulation and length of stay in hospital. However, (Wasylak et al., 1990) demonstrated a reduction of postoperative morbidity following patient-controlled analgesia, compared with those patients who received intramuscular analgesia on a PRN (pro re nata) basis. In a similar study, (Egbert et al., 1990) compared PCA morphine with PRN intramuscular morphine injections. Analgesia was significantly improved by PCA (3-day mean pain score, 40.5 ± 18.0 vs. 32.5 ± 15.0), without an increase in sedation. Significant postoperative confusion (18% vs. 2.3%) and severe pulmonary complications (10% vs. 0%) occurred significantly more frequently in intramuscular-treated controls.
Opioid response in Caucasians and Asians
Differences between the metabolism of opioids in Caucasians and Asians have been demonstrated in clinical studies (Houghton et al., 1992); (Lander et al., 1989).
Asians have been noted to be poor metabolisers of codeine and other opioids, including pethidine. Pethidine in particular has been noted to have a longer elimination half-life, particularly on repeated dosing. This may result in increased drug plasma levels and accumulation of toxic metabolites (Lee et al., 1997); (Yue et al., 1989); (Zhou et al., 1993).

ASA Status
The ability of the American Society of Anesthesiologists (ASA) score to identify patients at high risk of a poor outcome after surgery has been well documented ((Cullen et al., 1994) (Cullen et al., 1992); Owens, Felts & Spitznagel (1978); (Vacanti et al., 1970)). In essence, the ASA classification divides patients into five groups: healthy (class 1), mild to moderate systemic disease (class 2), severe systemic disease (class 3), severe systemic disorders that are already life-threatening (class 4), and moribund (class 5). Further classification of patients into trauma and emergency classes exists. (Hall & Hall, 1996) demonstrated that an ASA score greater than 2 identified more than 80% of patients who developed adverse events following abdominal surgery.
Social support
In general, social support from spouses, other family members and close friends is advantageous in terms of recovery from surgery (Wallston et al., 1983). (Kulik & Mahler, 1989) showed that adult patients undergoing coronary artery bypass surgery who had frequent visits from their spouse required less postoperative pain medication, spent less time in surgical intensive care and were discharged home sooner. Similar studies have also found that patients who underwent orthopaedic surgery and were highly satisfied with their social support made less PCA demands in comparison to patients with less social support (Gil et al., 1990).

Barriers to effective pain management
A cursory inspection of the literature or evidence from everyday clinical practice provide numerous examples of the subtle and complicated barriers that contribute to the poor treatment of pain. These barriers have generally been categorised as those related to health professionals and those related to patients (Wilder-Smith & Schuler, 1992). Hawthorn and Redmond (1998) suggest a further category, which includes factors within the healthcare system (Hawthorn & Redmond, 1998).

Factors related to healthcare professionals
Research indicates that nurses and medical staff are primarily responsible for the existence of unnecessary postoperative pain (Lander, 1990a). It appears that the problem is not so much in finding new strategies for managing pain, but in having healthcare professionals utilise available scientific knowledge in their daily practices. Whilst research about pain management practices and beliefs relates to both physicians and nurses, it is nurses who occupy the bulk of this literature. Research
has generally focused on nurses’ knowledge and attitudes and the influence of patient traits on nurses’ pain management practices.

There is ample evidence to indicate that both nurses and doctors have poor knowledge about pain and its management (Chapman et al., 1987) (Closs, 1996); (Cohen, 1980) Dalton, Blau, Lindley, Carlson, Youngblood & Greer,1999; (Dalton, 1989) (Davis, 1988); (Lander, 1990a)). In 1988, a National Health and Medical Research Council (NH&MRC) report on the management of severe pain found that “changes are called for in training, knowledge attitudes and practice of medical, nursing and allied professionals” (National Health and Medical Research Council, 1988) p. vii). Whilst this issue is being addressed by professional colleges and the development of practice guidelines (National Health and Medical Research Council, 1998), lack of knowledge remains a central issue in the problem of poor pain management. In particular, nursing programmes do not equip nurses with sufficient knowledge about:

- the nature and causes of pain;
- the difference between acute and chronic pain;
- the effects of different factors on pain perception and expression;
- methods of pain assessment;
- the pharmacology of analgesics;
- the principles of pain management (Hawthorn & Redmond, 1998).

Insufficient knowledge impairs a nurse’s ability to make appropriate clinical decisions and encourages an environment where ritualistic practices are common (Hawthorn & Redmond, 1998). Examples of poor decision making and ritualistic practices include:

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- underestimation of the severity of the patient's pain;
- overestimation of the effectiveness of interventions;
- administering a lower dose of analgesic at longer intervals than prescribed;
- reluctance to administer parenteral analgesics;
- withholding analgesics prescribed on a fixed time-interval basis when the patient is not in pain;
- administering the lowest dose of analgesic possible as opposed to the dose required to control the pain (Carr, 1990); (Cohen, 1980).

**Pain Assessment**

Lack of knowledge about pain assessment has been identified as a significant barrier to effective pain management. Good assessment is considered the cornerstone of successful pain control yet current pain assessment practices appear to be inadequate (Hawthorn & Redmond, 1998). Inadequate collection of data has been shown to contribute to poor pain assessment, with nurses’ perceptions of patients’ pain differing markedly to those of their patients. Nurses tend to overestimate the levels of least pain, underestimate the levels of worst pain and overestimate the effectiveness of interventions ((Camp, 1988)(Seers & Goodman, 1987). Some nurses fail to ask patients if they are in pain, and if they do, fail to confirm the intensity of the pain Donovan, Dillon & McGuire (1987). One study noted that only 45% of postoperative patients who reported moderate pain or greater ever recalled being asked by a nurse whether pain existed (Donovan, 1983). Assessment of pain may be further complicated because nurses often assume that patients will complain of pain, whereas patients expect the nurse to enquire about their pain (Seers & Goodman, 1987).

Nurses have also been noted to experience difficulty when communicating with patients who are terminally ill or those with chronic pain. Whilst able to identify
distressing symptoms, they make little attempt to elicit the intensity of each symptom, or the degree to which it affects the patient (Wilkinson, 1991). Hence, if nurses experience difficulty in communicating with patients, it is possible that any pain assessment they undertake will be superficial and interventions will be planned on the basis of inadequate data.

In addition to inadequate collection of data, it has been suggested that nurses have difficulty recognising the multidimensional nature of pain. Consequently, often the physical cause of pain is focused on and the influence of emotional, spiritual and social factors is ignored (McCaffrey, 1980).

Poor timing of assessment has been suggested as another barrier to effective pain management. It is not unknown for nurses to carry out a pain assessment whilst standing at a drug trolley in the middle of the ward. This may result in patients feeling compelled to take analgesics at this time because they know the trolley will not return for another four hours (Sofaer, 1992). (Wakefield, 1995) suggests it may also result in some nurses disbelieving their patients if they complain of pain at other times.

In the absence of certain physiological signs and expected pain behaviours (e.g. crying, moaning, facial expressions of suffering), nurses may assume that the patient is pain free, or doubt the severity of the pain. This is particularly true if pain control behaviours such as watching television or talking to friends are utilised (Hawthorn & Redmond, 1998). Interpretation of pain may also be hampered if nurses stereotype patients according to their culture, or other risk factors such as age, gender or socioeconomic class (Hawthorn & Redmond, 1998).
Nurses’ documentation of pain assessment has been shown to typically contain only a minimal amount of information. (Camp & O'Sullivan, 1987) showed that the paucity of recorded data was not due to the unavailability of information from the patient. Nurses documented significantly less than 50% of the information that patients were able to report to an independent investigator.

Problems have also been noted with nurses’ ability to document information regarding duration, intensity and quality of pain, the progress of patient’s pain and the patient’s perception of their pain (Camp, 1988); (Donovan et al., 1987). Reluctance to use pain assessment tools may further compound the problem of accurately documenting pain (Walker et al., 1990). However, despite the aforementioned factors, poor documentation of pain may simply be a reflection of poor documentation in nursing (Davis et al., 1994).

Other barriers to effective pain management include myths and misconceptions, which can contribute to irrational decision making. Examples of myths and misconceptions held by nurses include:

- patients who are sleeping are not in pain;
- patients who undergo the same operation should experience similar levels of pain;
- opioids should be reserved until the pain is severe;
- patients taking opioids over a long period will become addicted;
- elderly patients experience less pain than younger patients;
- infants do not experience pain (Hawthorn & Redmond, 1998).

Whilst a poor knowledge base has been shown to contribute to ineffective pain management, the attitudes of nurses have also been shown to influence assessment
and treatment of pain (Douglas, 1995). Nurses bring to any interaction their own set of attitudes about pain and its treatment. These attitudes are often culturally learned and can significantly affect decision making, particularly where cross-cultural differences exist. (Lander, 1990b) examined some of the misconceptions nurses have about pain management, reporting that poor knowledge alone did not explain the performance of nurses in pain management. Nurses appeared to have some underlying beliefs that contributed to the poor pain management. These included overconfidence in their clinical skills, where they tended to have a strong belief in the accuracy of their judgements about pain intensity and rely on their assessments more than the patient’s statements. Also, they tended to believe that pain management was better than it was. It has also been suggested that patients with difficult or negative behaviours are more likely to be labeled by nurses as not having real pain or as being addicted to analgesics (Lander, 1990b).

Patient traits have also been shown to influence nurses’ clinical decisions about pain management. These traits include patient ethnic background (discussed earlier), socioeconomic status and gender.
Although limited in number, studies have demonstrated that nurses infer greater pain to hypothetical patients of lower socioeconomic status compared to those of moderate or high status (Davitz et al., 1977) (Douglas, 1995).

Conflict exists regarding the influence of patient gender on nurses’ clinical decisions about pain management. Several studies support a gender bias, with nurses choosing to medicate men more frequently when presented with vignettes (McDonald & Bridge, 1991)). However, studies utilising vignettes have been criticised because they lack the usual verbal and nonverbal cues that occur during most nurse-patient interactions. (Calderone, 1990) studied postoperative coronary artery bypass patients for gender differences in analgesic administration frequency. The results revealed that male patients were administered pain medication significantly more frequently than female patients, and that female patients were administered sedative medication significantly more frequently than male patients. In some cultures, men are socialised into believing that pain is a test of manhood and therefore they should remain stoical in the face of pain (Hawthorn & Redmond, 1998).

Patients also contribute to the problem of ineffective pain management. Many patients are reluctant to report pain. This may be because of fear of addiction, a belief that ‘good’ patients do not complain of pain, or because of acceptance of pain as part of the normal postoperative course (Lander, 1990b); (Marks & Sachar, 1973)). The relationship between nurses knowledge and attitudes and pain management has been well documented, and to a lesser extent the impact of patient factors on pain management (Chapman et al., 1987) (Choinière et al., 1990) (Dalton, 1989) (Donovan, 1983) (Douglas, 1995) (Wakefield, 1995) (Watt-Watson, 1987) (Wilkinson, 1991) Less well studied are factors within the healthcare system. One
suggestion is that the socio-political environment of a hospital leads to poor pain management. In particular, practitioners have expectations about the amount of pain patients should have and how they can be expected to behave. Patients are subtly (and sometimes blatantly) encouraged to conform with practitioner expectations. Patients usually conform, since they have very little power. Those who don’t conform are branded deviants and have further pressure applied to conform (Fagerhaugh & Strauss, 1977).

Other barriers within the healthcare system include access to opioids (Hawthorn & Redmond, 1998). Some analgesics are not available in many countries and in some countries, there is widespread reluctance to use strong opioids. In nearly half the countries of the world, there is little or no use of morphine (Joranson, 1993).

Lack of specialised pain services has also been identified as being a barrier to effective pain management. This has resulted in multiple health care disciplines targeting pain management as an area requiring improvement ((American Pain Society, 1990); (American Pain Society, 1995)(National Health and Medical Research Council, 1998) (National Health and Medical Research Council, 1988)).

Numerous factors present barriers to the effective management of pain. The majority of these barriers would appear to relate to poor knowledge about pain and its management, particularly by nurses. In addition, the attitudes of nurses have been shown to influence their pain management practices. Patient factors and factors within the healthcare system are also significant barriers to effective pain management.
Opioid Analgesics

Opioid analgesics are unquestionably the mainstay approach in the treatment of severe acute pain (Portenoy, 1992), particularly pain caused by tissue trauma (such as that from surgery). Experimental and clinical evidence has established a favourable risk: benefit ratio of opioid treatment in the postoperative setting. With skillful use of these agents, a very high proportion of patients can achieve adequate relief of postoperative pain (Wall & Melzack, 1994).

Opioid is a general term defined as any drug, natural or synthetic, that has actions similar to those of morphine (Lehne et al., 1998). The older term, opiate, is more restrictive, meaning morphine-like drugs with a similar structure to morphine, thus excluding peptides (e.g. endorphins) and synthetic analogues (e.g. pethidine).

The body has three families of peptides that have opioid-like properties. These families are named enkephalins, endorphins and dynorphins and are found in the CNS and in peripheral tissues. They have numerous physiological functions, including analgesic activity, but they are not used as drugs. The opioid drugs are divided into two major groups, the pure agonists, which produce effects through activation of specific receptors (typically the mu receptor) and the agonist-antagonists, which combine a degree of agonist and antagonist activity on different receptors. The following discussion will be confined to the pure agonists, of which morphine is the prototype.
Drugs exert their effects on the body by interacting with specialised macromolecular components in cells called receptors (Rang et al., 1995). The existence of opioid receptors was first proposed in the early 1950s, but they were not identified until the 1970s (Hawthorn & Redmond, 1998). Three receptors, termed mu, delta and kappa, were found to mediate the main pharmacological effects of the opioid drugs (further types and subtypes have since been identified). They are located in the CNS (particularly the periaqueductal gray and dorsal horn of the spinal cord), pituitary gland and the gastrointestinal tract, and have recently been found on peripheral terminals of sensory nerves and cells of the immune system (McCaffery & Pasero, 1999).

The opioid agonists (morphine) relieve pain by mimicking the actions of endogenous opioid peptides, primarily at mu receptors. In the brain, activation of receptors in the limbic system decreases the unpleasant response to pain, whilst activation of receptors in the periaqueductal gray (and other areas) activates descending pathways of pain inhibition (Mather & Denson, 1992). Morphine also has actions outside the brain. Acting at the spinal level, morphine causes inhibition of transmission of nociceptive impulses through the dorsal horn, and inhibits release of substance P from dorsal horn neurons (Rang et al., 1995).

There is also evidence that morphine can act peripherally to prevent the transmission of nociceptive impulses to the spinal cord. The mechanism is probably related to blocking of substance P by binding to opioid receptors in peripheral nerve cells (Stein & Yassouridis, 1997). Thus, morphine acts at several sites, peripheral, spinal and supraspinal (brain), preventing transmission, modulating input or altering perception of nociceptive signals.

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Pethidine is virtually identical to morphine in its pharmacological effects, except that it tends to cause restlessness rather than sedation. It is the least potent of the common opioid analgesics and is administered in the largest doses. It is as widely used as morphine constituting around 40 per cent of all opioid analgesic use in Western countries (Mather & Denson, 1992). Intravenous injection of a single 50 mg dose in adult patients with postoperative pain achieves effective analgesic blood concentrations for 1 to 2 hours in most patients (an equianalgesic dose of morphine would achieve effective analgesic blood concentrations for 1 to 3 hours) (Mather & Denson, 1992). This short duration of analgesia is because of extensive redistribution within the body to muscle mass and well-perfused tissues. Repetitive dosing of pethidine can lead to accumulation of its toxic metabolite, norpethidine, which may result in hallucinations and convulsions (Rang et al., 1995).

Equianalgesic Doses
The term equianalgesia means approximately equal analgesia and is used when referring to the dose of analgesics that provide approximately the same analgesia as morphine (Hawthorn & Redmond, 1998) (McCaffrey, 1980). Equianalgesic doses provide a means for comparing different analgesics. Table 1 (p.40) provides equianalgesic doses for common opioids used for the management of postoperative pain.
Table 1
Equianalgesic dose of opioids

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Equivalent Parenteral Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>10 mg</td>
</tr>
<tr>
<td>Codeine</td>
<td>130 mg</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>100 mcg</td>
</tr>
<tr>
<td>Pethidine</td>
<td>75 mg</td>
</tr>
<tr>
<td>Papaveretum (Omnopon)</td>
<td>7.5 mg</td>
</tr>
</tbody>
</table>

Total cumulative dose of morphine was calculated by converting opioid analgesia to morphine equivalents and summing this analgesia for each 24 hour period.
Summary
Although the main thrust of this study is to explore the impact of linguistic diversity (English speaking versus non-English speaking) upon total analgesic consumed by surgical patients, there is also a need to explore the many and varied factors other than language, that influence analgesic administration and dosage. Throughout this review, several key areas (which are also easily obtainable from existing medical record data) have been identified as influencing post-operative pain and subsequent analgesia administration. These have been grouped into sociodemographic factors (age, gender, language spoken at home, insurance status, social support) and clinical factors such as procedure, duration of surgery, ASA status, length of hospitalisation, method of analgesic administration (PCA versus intramuscular injection). These factors will form the basis of a comprehensive model examining factors, inclusive of linguistic diversity, that influence total analgesic administration.

This comprehensive model will also identify, for the first time in Australian populations, the influence of linguistic diversity on analgesia administration, and its role in comparison with other factors that influence total analgesia administered.
A schematic representation of the key factors (or conceptual model) that influence analgesia administration that will be examined in this study, appears in Figure 1.

**Sociodemographic factors**
- Age
- Gender
- NESB/ESB
- Socioeconomic status

**Clinical factors**
- Health status (ASA)
- Length of operation
- Analgesic mode
- Analgesic type
- Type of surgical procedure
- Postoperative Complications

Figure 1. Diagram of conceptual model of factors influencing opioid consumption during the postoperative period
Hypotheses
The following hypotheses are posed:

Hypothesis 1 (H1): There will be a difference in the analgesic characteristics (analgesic mode [PCA versus IMI], analgesic type [morphine, pethidine, omnopon], and time of commencement of oral analgesia [within or beyond the first 24 hours post surgical procedure] of NESB surgical patients compared with English speaking surgical patients.

Hypothesis 2 (H2): There will be less cumulative dose of opioid consumed by NESB surgical patients compared with English speaking surgical patients within the first 24 hours following surgery;

Hypothesis 3 (H3): The cumulative dose of opioid consumed within the first 24 hours following surgery will be related to the patient’s age, gender, language spoken at home [NESB versus ESB], ASA score, socioeconomic status (health insurance status), social support (living with partner or not), and mode of analgesic administration (PCA versus intramuscular injection), in surgical patients.
Chapter 3

Methods

Introduction
This section describes the method used to obtain the relevant data. The design, sample and data collection tool are discussed. The data collection was undertaken following the granting of research and ethical approval by the University of Western Sydney (Macarthur) Ethics Review Committee and South Western Sydney Area Health Service Ethics Committee.

Design
Using a descriptive comparative and correlational design, a retrospective medical record audit was undertaken to examine the hypotheses and research questions posed in Chapter 2.

A descriptive comparative design, allowing the sample to be split into two groups, was used to examine Hypotheses 1 and 2. Then, a descriptive correlational design using the sample as one group was used to test Hypothesis 3.

Sample
Two hundred and seventy eight (N=278) patients who had undergone abdominal surgery and met the eligibility criteria for this study formed the study sample. The selection criteria were as follows: (1) aged between 18 and 65 years (2) Arabic, Vietnamese, Italian, Chinese or English speaking; (3) admitted to one of four teaching hospitals in the SWSAHS between 1 March 1996 and 28 February 1997;
and (4) undergoing open abdominal surgery, identified by the following ICD –9CM codes:

- 45.7 (partial excision of large intestine);
- 46.0–46.9 (exteriorisation of intestine eg. colostomy);
- 47.0–47.9 (operations on appendix - open);
- 48.5 (abdominoperineal resection of rectum);
- 51.2 (open cholecystectomy);
- 68.3–68.6 (abdominal hysterectomy).

Open abdominal surgery was selected due to the uniformity of the procedures and hence, an expectation that analgesic requirements would be similar (Sinatra et al., 1992).

Patients were excluded from the study if factors considered to alter or affect analgesic requirements were present. These included patients with any degree of altered mental status (as determined by the medical officer in patient medical admission) as patients who are confused or demented are often unable to communicate their distress (Marzinski, 1991) Porter, Malhotra, Wolf, Morris, Miller & Smith 1996). Patients who were ventilated (paralysed and sedated) in the immediate postoperative period were also excluded as it was considered they would be unable to express their need for pain relief. Opioid-dependent patients (as defined by the medical officer in patient medical admission) were excluded, as they generally require larger doses of analgesic than non-opioid dependent patients ((Sinatra et al., 1992) and those who received epidural analgesia during the postoperative period were excluded due to a mixture of local anaesthetic and opioid resulting in lower doses of each being required for equivalent analgesia (Wall & Melzack, 1994).
Selection of Ethnic groups
The choice of language groups for inclusion in this study was based on demographic data describing the population of South Western Sydney Area Health Service (South Western Area Health Service, 1995).

South Western Sydney is an area of exceptional cultural diversity, with almost 200,000 residents speaking a language other than English at home (SWSAHS, 1995). Overall, the population of South Western Sydney Area Health Service (SWSAHS) has increased by 10.1% in the 5 year period 1986-1991. Those born overseas in a non English speaking country (NESB) have increased at a much faster rate (34.6%) over the same period, with some Local Government Areas (LGA’s) experiencing much more rapid growth (Liverpool 39.7% and Campbelltown 59.6%). In 1991, 26.3% of the Area’s population was NESB—the largest of any of the Area Health Services (SWSAHS, 1995).

Significant changes have taken place in the languages spoken in SWSAHS. Other than English, Arabic is the most prevalent language, increasing 67.2% in the period 1986 to 1991. Almost 30,000 people speak this language representing 5% of the total Area population. The next most prevalent language is Vietnamese, where there has been a substantial 141% increase from just under 10,000 in 1986 to almost 24,000 in 1991. Other dominant language groups include Italian (23,000) and Chinese languages (Cantonese, Mandarin and other Chinese languages) (20,000).

The main countries of birth reflect a similar pattern to languages spoken in SWSAHS. These countries include: Vietnam (28,094), Yugoslav countries (15,315), Italy (14,006), Lebanon (12,820) and other Middle East (8,345). NESB residents born in China totalled 5,879 (South Western Sydney Area Health Service, 1995).
Based on major language groups and major countries of birth of the SWSAHS NESB population, subjects were selected according to country of birth (Lebanon, Italy, Vietnam, China) and language spoken at home (Arabic, Italian, Vietnamese, Mandarin/Cantonese). The total sample also included a comparison group consisting of Australian born/English speaking patients, who were considered to represent the dominant culture.

**Data Collection Procedure**
The Medical Records Departments at participating hospitals were contacted. A computerised list of all patients meeting the following criteria was provided: age 18-65 years; surgical procedure as defined by one of the following ICD-9CM codes 45.7, 46.0-46.9, 47.0-47.9, 48.5, 51.2, 68.3-68.6, language spoken at home either English, Arabic/Lebanese, Italian, Vietnamese or Chinese.

Requests for 30 records (maximum permitted) at a time were submitted to the relevant medical records department. These records were randomly selected from the prelisting by the researcher. The researcher was notified when the records were available, and arrangements were made to view the records in the Medical Records Department. Each record was reviewed to determine if each patient’s data met inclusion criteria and none of the exclusionary criteria.
Data Collection Tool
A specific, medical record audit tool was developed to ensure accurate and consistent information was obtained for each individual record examined. This tool was trialled on 30 records and the final audit tool appears in Appendix A.

The following information was obtained from the MRN1 of each record: hospital, date of admission and discharge, medical record number, age, gender, marital status, country of birth, language spoken at home, health insurance status and operative procedure. Date of operation, operative time (hours) and ASA status were obtained from the anaesthetic chart and operation record. The development of postoperative complications was derived from review of the discharge summary. Finally, mode of analgesic administration (PCA or IMI), type of opioid (morphine, pethidine, other), cumulative dose of opioid for 96 hours postop (in 24 hour increments) and commencement of first non-opioid were obtained from the patient’s medication chart.

Several special data items require some further explanation.

ASA status, previously discussed in Chapter 2, is an indicator of the pre-surgical health of the patient. The ability of the American Society of Anesthesiologists (ASA) score to identify patients at high risk of a poor outcome after surgery has been well documented (Cullen et al., 1994). This indicator has demonstrated reliability and validity (Vacanti et al., 1970) and is used extensively in the clinical practice of anaesthetists within SWSAHS.

Post-operative complications included the development of hospital-acquired post-operative wound infection, unplanned return to operating theatre or hospital acquired
bacteraemia and were identified within the discharge summary of the patient's medical record. These complications were based on indicators developed by the Commonwealth Department of Health and Family Services' Hospital Wide Quality of Care Indicators Project (Health Services Outcomes Branch, 1996).

Length of hospitalisation was determined by discharge date minus admission date.

Cumulative dose of opioid was measured for 96 hours postop (in 24 hour increments). All opioids were calculated as equivalents of morphine using standard algorithms which took into account differences in morphine equivalents between parenteral preparations (Hawthorn & Redmond, 1998) (McCaffery & Pasero, 1999) (Portenoy, 1992). The calculation of the actual dose was derived from Table 1.

The first 24 hours post-op was considered to commence on the patient's return to the ward. This reference point was selected because administration of analgesia on the ward is usually based on the patient's request, whereas administration of analgesia in the Recovery Room is more often at the discretion of the nursing staff.

Commencement of the first non-opioid refers to the commencement of oral analgesia that was not opioid in nature. The only non opioid used in this study was paracetamol.
Ethical Considerations
Ethical approval for this study was sought from the University of Western Sydney, Macarthur, Ethics Review Committee. A certificate of approval was granted (Protocol No. 93/37) (Appendix B) approved on 30 May 1995. Further approval was sought from South Western Sydney Area Health Service. The Ethics Committee of this Health Service resolved that the study was primarily a quality assurance study and therefore, formal Ethics Committee approval was not required but a letter from the Chairperson of this Committee was obtained outlining this situation and supplying a reference number (Appendix C).

National Health and Medical Research Council guidelines were adhered to during all stages of the study.
Analysis
Univariate and bivariate descriptive statistics were used to describe the sample
characteristics and the model variables. Nominal and ordinal data were summarised
in terms of frequencies, while ratio data were summarised in terms of means and
standard deviations.

The choice of appropriate statistical procedures for this study were based on the
number of variables (1, 2, more than 2), level of measurement (nominal, ordinal,
ratio), type of variable (independent, dependent), and distribution of variable
(normal, non-normal) (Burns & Grove, 1997). For example, nonparametric tests
were used where data was measured on a nominal or ordinal scale. In addition,
where the distribution of sample means was non-normal, non parametric tests were
also used due to less restrictive assumptions about the shape of the distribution of the
critical variables (Polit & Hungler, 1997).

The results were analysed using the Statistical Package for the Social Sciences
(SPSS) for Windows, Version 9.0. An alpha level of .05 was used for all statistical
tests.

Examining differences between two groups
Parametric tests were used for ratio scale data. These included the $t$-test for
independent groups which was used to test the difference between two independent
group means, such as the difference between the total postoperative dose of
morphine in English speaking and non-English speaking groups. Whilst use of the $t$-
test generally assumes sample means from the population are normally distributed,
this test is also considered robust to moderate violation of this assumption,
particularly when the sample sizes are large (Burns & Grove, 1997). For this reason, the $t$-test was considered to be an appropriate statistical analysis to test for significant differences between the two groups.

**Testing differences between more than two groups**
Where analysis was required to test the difference among the means of three or more independent groups, or of more than one independent variable, the procedure known as Analysis of Variance (ANOVA) was used. The ANOVA examined differences between analgesia consumed for various hospitals. Like the $t$-test, assumptions involved in ANOVA include normal distribution of sample means but for reasons previously explained, particularly because large sample sizes tend to diminish the detrimental effects of non-normality (Hair et al., 1998), it was considered appropriate to use this parametric test.

Because it is not possible to determine from the ANOVA exactly where the significant differences lie, post hoc analyses were conducted to determine the location of the differences among the groups. In this study, the Scheffe test was used, and as a consequence, the increased risk of a Type II error must be taken into consideration when interpreting the results (Burns & Grove, 1997).

**Model Testing**
Multivariate statistical analysis was used to test the relationship between two or more independent variables and one dependent variable. In this study, multiple regression was used to explain as much of the variance in the dependent variable as possible (Burns & Grove, 1997). Like all analyses, assumptions underly multivariate analysis. The most fundamental assumption in multivariate analysis is normality.
(Hair et al., 1998), which refers to the shape of the data distribution and how it corresponds to the normal distribution — the benchmark for statistical methods. In multivariate analysis, the need to test the statistical assumptions is increased. This is due to the complexity of the relationships (typically due to the use of a large number of variables), making the potential distortions and biases more potent when the assumptions are violated. Also, the complexity of the analyses and of the results may ‘mask’ the signs of assumption violations, often apparent in univariate analyses. Multivariate analyses will nearly always produce results — even when the assumptions are severely violated. For these reasons, it was necessary to transform data in order to accommodate a non-normal distribution (Hair et al., 1998).

Transformation to achieve normality is generally based on the pattern of the variable (Hair et al., 1998). The two most common patterns are ‘flat’ distributions and skewed distributions. The dependent variable examined in this study — mean dose of morphine (mg) was substantially positively skewed.

Positively skewed distributions are usually best transformed by taking the logarithm. (Tabachnick & Fidell, 1996) and (Hair et al., 1998) suggest logarithmic transformation, adding a constant for distributions that contain values less than 1 (to avoid taking the log of zero). In this study, 10% of the sample received no parenteral analgesia in the postoperative period.

Traditionally, variables in a regression equation are measured at the interval level. However, categorical or dichotomous variables can be used by replacing them with dummy variables. A dummy variable is a dichotomous variable that represents one category of a nonmetric independent variable (Hair et al., 1998). Table 11 (p.69)
contains all model variables as well as the recoding that was carried out prior to multiple regression analysis.

Prior to regression analysis, the extent of collinearity in the data was examined. A correlation matrix of model variables showed no evidence of multicollinearity in the regression equations used to answer the research hypotheses ($r<.65$) (Burns & Grove, 1997). Correlations between independent variables ranged from $r=.027$ to $=.578$.

Multicollinearity was further assessed by determining the tolerance value and its inverse—the variance inflation factor (VIF). These measures demonstrate the degree to which each independent variable is explained by the other independent variables. A common cutoff threshold is a tolerance value of .10, which corresponds to a VIF value above .10 (VIF is the inverse of tolerance). This suggested cutoff for the tolerance value of .10 corresponds to a multiple correlation of .95. Further, a multiple correlation of .9 between one independent variable and all others would result in a tolerance value of .19. Thus, any variables with tolerance values below .19, or a VIF above 5.3, would have a correlation of more than .90 (Hair et al., 1998).

Variance inflation factors ranged from 1.02 to 1.80, whilst tolerances ranged from .69 to .99. These were considered within acceptable limits (Hair et al., 1998).

The following chapter presents the results from these analyses.
Chapter 4

Results

Introduction
This chapter discusses the results of the retrospective medical record audit undertaken to examine the hypotheses identified in Chapter 2. These hypotheses were: Hypothesis 1 (H1) which examines differences in the analgesic characteristics of NESB and English speaking surgical patients; Hypothesis 2 (H2) which investigates cumulative dose of opioid consumed within the first 24 hours following surgery and Hypothesis 3 (H3) which tests a model inclusive of sociodemographic and clinical variables, to explain total cumulative dose of opioid within the first 24 hours following surgery.

As the sample characteristics are critical to the interpretation of these results, these appear first in this section.

Sample Characteristics
From the sample of 278 patients who had undergone abdominal surgery at four South Western Sydney Area hospitals, only 3 were recorded as having been born in China. Because of the extremely small sample size of this specific non-English speaking group, it was decided to combine this group with patients born in countries listed as ‘other’. These patients were therefore still able to be used in the analyses, as language spoken at home (as opposed to country of birth) was used as the measure of ethnicity.
The mean age of all patients was 37.48 years (median 35 years) with a standard deviation of 13.42 years (range 18-65 years). Fifty-six per cent were female (n=156). Almost two thirds of the sample (n=167) were living with a partner, and most of the patients (86%) had no form of medical insurance. Fifty-three percent of patients (n=149) were born in Australia, with the remainder born in Vietnam (20.5%), Lebanon (11.2%), Italy (4.7%) and Other (10.1%). Almost three quarters of the sample stated they spoke English at home (n=207).

Patients were also categorised into English speaking and non-English speaking groups to allow for comparison with demographic data describing the population of South Western Sydney Area Health Service (SWAHS) (South Western Sydney Area Health Service, 1995) and other studies (Todd et al., 1994; Calvillo & Flaskerd, 1993; Todd et al., 1993; Feldt et al., 1998). Language spoken at home was recoded to form two groupings (English speaking and non-English speaking) and later in the analyses also a dichotomous variable.

Non-English speaking patients represented 25.5% of the sample (n=71), which is similar to the 26.3% of people recorded as non-English speaking in the South Western Sydney Area Health Service (South Western Sydney Area Health Service, 1995).

Table 2 (p.57) and Table 3 (p.58) display many of the social and demographic characteristics of the sample and the differences between the two comparison groups based on language spoken (NESB and ESB surgical patients).
### Table 2
Sociodemographic characteristics of 278 abdominal surgery patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>122</td>
<td>(43.9)</td>
</tr>
<tr>
<td>Female</td>
<td>156</td>
<td>(56.1)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living with partner</td>
<td>167</td>
<td>(60.1)</td>
</tr>
<tr>
<td>Not living with partner</td>
<td>111</td>
<td>(39.9)</td>
</tr>
<tr>
<td><strong>Country of birth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>149</td>
<td>(53.5)</td>
</tr>
<tr>
<td>Vietnam</td>
<td>57</td>
<td>(20.5)</td>
</tr>
<tr>
<td>Lebanon</td>
<td>31</td>
<td>(11.2)</td>
</tr>
<tr>
<td>Italy</td>
<td>13</td>
<td>(4.7 )</td>
</tr>
<tr>
<td>Other</td>
<td>28</td>
<td>(10.1)</td>
</tr>
<tr>
<td><strong>Language spoken at home</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>207</td>
<td>(74.5)</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>43</td>
<td>(15.5)</td>
</tr>
<tr>
<td>Arabic</td>
<td>21</td>
<td>(8.6 )</td>
</tr>
<tr>
<td>Italian</td>
<td>7</td>
<td>(2.5 )</td>
</tr>
<tr>
<td><strong>Insurance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>240</td>
<td>(86.3)</td>
</tr>
<tr>
<td>Private</td>
<td>38</td>
<td>(13.7)</td>
</tr>
</tbody>
</table>
Comparison of sociodemographic characteristics for English speaking and non-English speaking groups

The mean age of the English speaking group was 36.46 years with a standard deviation of 13.60 years, whilst the mean age of the non-English speaking group was 40.49 years (standard deviation 12.50 years). This difference reached significance (p<.05). Non-English speaking patients were also more likely to be living with a partner ($\chi^2 = 6.893$, df=1, p<.01) and less likely to be privately insured ($\chi^2 = 5.217$, df=1, p<.05). Not surprisingly, 98.6% of non-English speaking patients were born overseas.

Table 3
Comparison of sociodemographic characteristics of ESB and NESB groups

<table>
<thead>
<tr>
<th>Sociodemographic characteristic</th>
<th>Group 1 English speaking (n=207)</th>
<th>Group 2 non-English speaking (n=71)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age(^a) mean (SD) years</td>
<td>36.46(13.60)</td>
<td>40.49(12.50)</td>
<td>t=-2.182, df=275 p&lt;.05</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>(\chi^2 = .766,\ df=1) p=.381</td>
</tr>
<tr>
<td>Male %</td>
<td>45.40</td>
<td>39.40</td>
<td></td>
</tr>
<tr>
<td>Female %</td>
<td>54.60</td>
<td>60.60</td>
<td></td>
</tr>
<tr>
<td>Origin</td>
<td></td>
<td></td>
<td>(\chi^2 = 104.424,\ df=1) p&lt;.001</td>
</tr>
<tr>
<td>Australian born %</td>
<td>71.50</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>Overseas %</td>
<td>28.50</td>
<td>98.60</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td>(\chi^2 = 6.893,\ df=1) p&lt;.01</td>
</tr>
<tr>
<td>Living with partner %</td>
<td>55.60</td>
<td>73.20</td>
<td></td>
</tr>
<tr>
<td>Not living with partner %</td>
<td>44.40</td>
<td>26.80</td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
<td></td>
<td>(\chi^2 = 5.217,\ df=1) p&lt;.05</td>
</tr>
<tr>
<td>Public %</td>
<td>83.60</td>
<td>94.40</td>
<td></td>
</tr>
<tr>
<td>Private %</td>
<td>16.40</td>
<td>5.60</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) - missing data (n = 1).

Note. Comparison tests - age: independent sample t-test; other variables: Pearson \(\chi^2\) test.
The groupings of English speaking and non-English speaking patients were also used for the analysis of the clinical variables. This grouping would not only allow for comparison with other studies (Todd et al., 1994; Calvillo & Flaskerud, 1993; Todd et al., 1993; Feldt et al., 1998), but would be useful in the development of more specific pain services for NESB groups. In addition, two clinical variables were recoded. ASA status, which was a measure of health status, was recoded into a dichotomous variable due to small numbers in the five subgroups and missing data (not recorded in patient’s notes by medical officer). ASA status was recoded into either healthy (ASA status ‘healthy patient’ = 1) or non-healthy (ASA status ‘mild systemic disease’ through to ‘moribund’ = 0). The development of postoperative complications, which initially was defined as the development of hospital-acquired postoperative wound infection, unplanned return to operating theatre or hospital acquired bacteraemia was also placed into a dichotomous form into complications (1) nil complications (0). This was due to the small numbers in each of the categories for complications.

Comparison of clinical characteristics for English-speaking and non-English speaking groups.

A comparison of clinical characteristics of English-speaking and non-English speaking groups revealed no significant differences for length of operation ($t=896$, $df=276$, $p=.371$), or health status ($\chi^2=877$, $df=1$, $p=.349$). However, non-English speaking patients were found to have a higher proportion of postoperative complications ($\chi^2=10.596$, $df=1$, $p<.01$) than the English-speaking group. Table 4 (p.60) and Table 5 (p.60) demonstrate these issues more comprehensively.
### Table 4
Comparison of clinical characteristics of ESB and NESB groups

<table>
<thead>
<tr>
<th>Clinical characteristic</th>
<th>English speaking (n=207)</th>
<th>non-English speaking (n=71)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of operation, mean(SD) hr</td>
<td>1.41 (.87)</td>
<td>1.31 (.65)</td>
<td>t= .896, df=276, p=.371</td>
</tr>
<tr>
<td>Health status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>healthy</td>
<td>74.1</td>
<td>67.3</td>
<td>( \chi^2 = .877, df=1, p=.349 )</td>
</tr>
<tr>
<td>non-healthy</td>
<td>25.9</td>
<td>32.7</td>
<td></td>
</tr>
<tr>
<td>Postoperative complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No complications</td>
<td>99.0</td>
<td>91.5</td>
<td>( \chi^2 = 10.596, df=1, p&lt;.01 )</td>
</tr>
<tr>
<td>Complications</td>
<td>1.0</td>
<td>8.5</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Comparison tests - length of operation: independent sample t-test; other variables: Pearson \( \chi^2 \) test.

Specific inspection of the types of surgery does highlight some obvious differences, although percentage differences were less remarkable (see Table 5)

### Table 5
Surgical interventions for ESB and NESB groups

<table>
<thead>
<tr>
<th>Procedure (%)</th>
<th>English speaking (n=207)</th>
<th>non-English speaking (n=71)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colectomy</td>
<td>No. (%)</td>
<td>No. (%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>27 (13.0)</td>
<td>8 (11.2)</td>
<td></td>
</tr>
<tr>
<td>Formation of colostomy</td>
<td>7 (3.4)</td>
<td>1 (1.4)</td>
<td>( \chi^2 = 1.721, df=5, p=.886 )</td>
</tr>
<tr>
<td>Appendicectomy</td>
<td>119 (57.5)</td>
<td>44 (62.0)</td>
<td></td>
</tr>
<tr>
<td>AP resection</td>
<td>2 (1.0)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td>20 (9.7)</td>
<td>7 (9.9)</td>
<td></td>
</tr>
<tr>
<td>Abdominal</td>
<td>31 (15.0)</td>
<td>11 (15.5)</td>
<td></td>
</tr>
<tr>
<td>hysterectomy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>1 (.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Comparison test - Pearson \( \chi^2 \) test.

*Chapter 4*
Testing Differences in Analgesic Characteristics of non-English speaking and English speaking Surgical Patients: Hypothesis 1

No differences were found between non-English speaking and English speaking patients with respect to the type of analgesia prescribed (morphine, pethidine or omnopon) ($\chi^2 = 2.352$, df=2, $p = .308$), the commencement of oral analgesia ($\chi^2 = .192$, df=2, $p = .909$), or, the mode of analgesia (Patient Controlled Analgesia or Intramuscular Injection) ($\chi^2 = 2.621$, df=1, $p = .105$) (see Table 6, p.62). These results did not support Hypothesis 1. Approximately three percent (2.9%) of English speaking and 7% of non-English speaking patients ($n=11$) received no opioid analgesia during the postoperative period. There was no statistical difference between groups for this measure ($\chi^2 = 2.389$, df=1, $p = .122$).
Table 6
Comparison of analgesic characteristics by ESB and NESB groups

<table>
<thead>
<tr>
<th>Analgesic characteristic</th>
<th>English speaking (n=207)</th>
<th>non-English speaking (n=207)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Analgesic mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCA</td>
<td>34.3</td>
<td>23.9</td>
<td>$\chi^2 = 2.621$, df=1, p=.105</td>
</tr>
<tr>
<td>IMI</td>
<td>65.7</td>
<td>76.1</td>
<td></td>
</tr>
<tr>
<td>Analgesic type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td>46.4</td>
<td>38.0</td>
<td>$\chi^2 = 2.352$, df=2, p=.308</td>
</tr>
<tr>
<td>Pethidine</td>
<td>52.7</td>
<td>62.0</td>
<td></td>
</tr>
<tr>
<td>Omnopropon</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commencement of oral analgesia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within first 24 hours</td>
<td>24.2</td>
<td>25.4</td>
<td>$\chi^2 = 0.192$, df=2, p=.909</td>
</tr>
<tr>
<td>After first 24 hours</td>
<td>46.4</td>
<td>47.9</td>
<td></td>
</tr>
<tr>
<td>Nil oral analgesia</td>
<td>29.5</td>
<td>26.8</td>
<td></td>
</tr>
<tr>
<td>Nil PCA or IMI analgesia</td>
<td>2.9</td>
<td>7.0</td>
<td>$\chi^2 = 2.389$, df=1, p=.122</td>
</tr>
</tbody>
</table>

**Note.** Comparison tests: Pearson $\chi^2$ test.
Testing Differences in cumulative dose of opioid received by non-English speaking and English speaking surgical patients:
Hypothesis 2
A comparison of the total dose of opioid (converted to equianalgesic dose of morphine) for English speaking and non-English speaking patients revealed a significant difference in the mean dose of morphine during the first 48 hours postoperatively. This difference was particularly significant for the first 24 hours post-operative, where English speaking patients received a mean dose of 37.31 mg of morphine with a standard deviation of 29.14 mg, whilst non-English speaking patients received 22.16 mg of morphine (standard deviation of 16.40 mg) \((t=5.393, df=217.174, p<.001)\). Similar differences were seen for 25-48 hours postoperative \((t=3.683, df=212.448, p<.001)\). By day 3 (49-72 hours postoperative), this difference had disappeared, with both groups receiving similar doses of morphine \((t=1.423, df=188.864, p=.156)\) (see Table 7, p.64).
Table 7  
Cumulative dose of opioid consumed during the postoperative period by ESB and NESB groups

<table>
<thead>
<tr>
<th>Morphine</th>
<th>English speaking (n=207)</th>
<th>Non-English speaking (n=71)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 24 hrs mean (SD) mg</td>
<td>37.31(29.14)</td>
<td>22.16(16.40)</td>
<td>t=5.393, df=217.17, p&lt;.001</td>
</tr>
<tr>
<td>25 - 48 hrs mean (SD) mg</td>
<td>23.11(32.84)</td>
<td>11.32(18.91)</td>
<td>t=3.683, df=212.44, p&lt;.001</td>
</tr>
<tr>
<td>49 - 72 hrs mean (SD) mg</td>
<td>8.90(20.52)</td>
<td>5.88(13.27)</td>
<td>t=1.423, df=188.86, p=.156</td>
</tr>
<tr>
<td>73 - 96 hrs mean (SD) mg</td>
<td>3.31(11.04)</td>
<td>2.93(13.81)</td>
<td>t=.238, df=276, p=.812</td>
</tr>
</tbody>
</table>

Note: Comparison test: independent sample t-test.

Whilst it would appear that the non-English speaking group consistently consumed less morphine than the English speaking group, it is not possible to determine if this difference was due to choosing to use less analgesia (as for those using PCA) or whether this group requested, and/or received, less analgesia (for those prescribed IMI, and therefore on as needed basis, analgesia).

Further analysis revealed the method of administration (PCA or IMI) to be a significant factor in the amount of analgesia consumed in the postoperative period. Table 7 demonstrates that the non-English speaking group still consumed less analgesia than the English speaking group, despite the method of administration. English-speaking patients used a mean dose of 61.57 mg (standard deviation 33.96 mg) PCA morphine in the first 24 hours postoperative. The mean dose of morphine...
used by non-English speaking patients was much less (40.27 mg; (SD16.11 mg) 
(t=3.795, df=54.164, p<.001).

The mean dose of PCA morphine consumed by both groups was two and a half times 
the mean dose of IMI analgesia.

The mean dose of IMI morphine received by English speaking patients was again 
significantly more than that received by the non-English speaking group. English 
speaking patients received 24.64 mg of morphine in the first 24 hours postoperative 
(SD =15.05 mg) whilst the non-English speaking group received 16.45 mg (SD 
=11.77 mg) (t=3.979, df=123.715, p<.001) (see Table 8, Figure 2, p.66). These 
analyses confirmed Hypothesis 2.

Table 8
PCA and IMI cumulative dose of opioid during the first 24 hour postoperative period 
in ESB and NESB groups

<table>
<thead>
<tr>
<th>morphine</th>
<th>English speaking</th>
<th>non-English speaking</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCA mean (SD) mg</td>
<td>61.57(33.96)</td>
<td>40.27(16.11)</td>
<td>t=3.795, df=54.164, p&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n = 88)</td>
</tr>
<tr>
<td>IMI mean (SD) mg</td>
<td>24.64(15.05)</td>
<td>16.45(11.77)</td>
<td>t=3.979, df=123.715, p&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n = 190)</td>
</tr>
</tbody>
</table>

Note: Comparison test: independent sample t-test
Figure 2. PCA and IMI cumulative dose of morphine in the first 24 hour postoperative period in ESB and NESB groups

As one of the hospitals from which the sample was derived had an Acute Pain Service (Hospital 4), it was felt that a review of the potential source of differences related to hospital practice may have some bearing on the interpretation of the results.

Table 9 (p. 67) highlights that Hospital 4 did have greater proportions of patients receiving PCA. Differences in language were also consistent with Census data and hospital separation data. Differences in the mean total dose of morphine received were not significant.
Table 9
Comparison of sample characteristics by hospital

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Hospital 1 (n = 69)</th>
<th>Hospital 2 (n = 95)</th>
<th>Hospital 3 (n = 48)</th>
<th>Hospital 4 (n = 86)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of analgesia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCA %</td>
<td>26.1</td>
<td>26.3</td>
<td>18.8</td>
<td>54.5</td>
<td>( \chi^2 = 21.920, \text{df}=3, ) ( p &lt; 0.001 )</td>
</tr>
<tr>
<td>IMI %</td>
<td>73.9</td>
<td>73.7</td>
<td>81.3</td>
<td>45.5</td>
<td></td>
</tr>
<tr>
<td>Language background</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English-speaking %</td>
<td>62.3</td>
<td>96.8</td>
<td>66.7</td>
<td>60.6</td>
<td>( \chi^2 = 38.568, \text{df}=3, ) ( p &lt; 0.001 )</td>
</tr>
<tr>
<td>Non-English speaking %</td>
<td>37.7</td>
<td>3.2</td>
<td>33.3</td>
<td>39.4</td>
<td></td>
</tr>
<tr>
<td>Health status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy %</td>
<td>63.9</td>
<td>79.1</td>
<td>75.6</td>
<td>64.7</td>
<td>( \chi^2 = 5.103, \text{df}=3, ) ( p = 0.164 )</td>
</tr>
<tr>
<td>Non-healthy %</td>
<td>36.1</td>
<td>20.9</td>
<td>24.4</td>
<td>35.3</td>
<td></td>
</tr>
<tr>
<td>Morphine (first 24hrs), mean (SD) mg</td>
<td>29.73 (27.53) 36.12 (23.52)</td>
<td>27.31 (26.27) 37.90 (31.66)</td>
<td>( F = 2.156, \text{df}=3, ) ( p = 0.094 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Comparison tests: Pearson \( \chi^2 \) test.

\(^a\) One way analysis of variance procedures were used.

However, differences in the mean dose of IMI morphine in the first 24 hours was significantly different across hospitals (see Table 10, p.68). These differences appear to complement the differences seen in Table 8 (p.65).
Table 10
One-way Analysis of Variance of hospitals and cumulative dose of IMI opioid during the first 24 hours

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Hospital 1 (n = 51)</th>
<th>Hospital 2 (n = 70)</th>
<th>Hospital 3 (n = 39)</th>
<th>Hospital 4 (n = 30)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>morphine (first 24hrs), mean (SD) mg</td>
<td>19.61 (12.92)</td>
<td>27.74 (14.94)</td>
<td>20.32 (15.37)</td>
<td>16.83 (12.19)</td>
<td>F=5.84, df=3, p&lt;.01^a</td>
</tr>
</tbody>
</table>

^aOne way analysis of variance procedures were used.

Developing and testing a comprehensive model, inclusive of sociodemographic and clinical variables, to predict cumulative dose of opioid within the first 24 hours following surgery: Hypothesis 3.

As previously stated, recoding of a number of variables was required before modeling could proceed. Table 11 (p.69) demonstrates the recoding of independent and dependent variables.
Table 11
Summary Descriptive Statistics and Recoding of Variables used in the regression models when cumulative dose of opioid during the first 24 hour postoperative period was the dependent variable

<table>
<thead>
<tr>
<th>Category of Variable</th>
<th>Initial Units of Measure</th>
<th>Recoding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sociodemographic Age</td>
<td>years</td>
<td></td>
</tr>
</tbody>
</table>
| Gender | Male=1  
Female=2 | Male=1  
Female=0 |
| Language spoken at home | English=1  
Vietnamese=2  
Arabic=3  
Chinese=4  
Italian=5 | English spoken at home=0  
Not English spoken at home=1 |
| Insurance | Public=1  
Private=2 | Not insured=0  
Insured=1 |
| Clinical | | |
| Postoperative complications | Nil=0  
Unplanned return to OR=1  
Hospital acquired postop wound infection=2  
Hospital acquired bacteraemia=3  
Other=4 | No complications=0  
Complication(s)=1 |
| Length of operation | hours | |
| ASA status | Healthy patient=1  
Mild systemic disease=2  
Severe systemic disease=3  
Severe life-threatening=4  
Moribund=5  
Not recorded=6 | Not healthy=0  
Healthy=1 |
| Analgesic mode | PCA=1  
IMI=2 | PCA=0  
IMI=1 |
| **Dependent Variable** | Morphine 0-24hr | mg |
For the regression analysis 11 cases were removed due to nil consumption of opioid analgesia in the first 24 hours. This resulted in 267 patients being included for regression analysis. Non-normal distribution was detected in the scores of cumulative dose of morphine in the first 24 hours. The distribution of these scores was substantially positively skewed. They were transformed to produce normality using the procedure recommended by Tabachnick and Fidell, 1996, p.83. The scores were transformed in the following manner:

*Logarithm 10 (cumulative dose in 24 hours)*

![Graph](image)

*Figure 3.* Normal Q-Q plot of the transformed dependent variable, total cumulative dose of opioid in the first 24 hours
Table 12
Correlation coefficients between sociodemographic and clinical characteristics and cumulative dose of opioid during the first 24 hour postoperative period

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>morphine used 0-24 hrs</td>
<td>.254**</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>morphine used 24-48 hrs</td>
<td>.303**</td>
<td>.728**</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>morphine used 49-72 hrs</td>
<td>.183**</td>
<td>.553**</td>
<td>.603**</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>morphine used 73-96 hrs</td>
<td>.148*</td>
<td>.420**</td>
<td>.430**</td>
<td>.618**</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>postoperative complications</td>
<td>.160**</td>
<td>.027</td>
<td>.031</td>
<td>.010</td>
<td>.066</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>healthy vs non-healthy by ASA insurance</td>
<td>-.418**</td>
<td>-.157*</td>
<td>-.154*</td>
<td>-.088</td>
<td>-.028</td>
<td>-.208**</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-.036</td>
<td>.094</td>
<td>.038</td>
<td>.164**</td>
<td>.145*</td>
<td>-.022</td>
<td>.173*</td>
<td>.112</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>analgesic mode PCA/IMI</td>
<td>-.463**</td>
<td>-.601**</td>
<td>-.608**</td>
<td>-.474**</td>
<td>-.329**</td>
<td>-.068</td>
<td>.340**</td>
<td>.023</td>
<td>.041</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>commencement of oral analgesia</td>
<td>-.131</td>
<td>-.068</td>
<td>-.124*</td>
<td>-.314**</td>
<td>-.241**</td>
<td>-.036</td>
<td>.028</td>
<td>-.096</td>
<td>-.179**</td>
<td>.117</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English speaking non-English speaking</td>
<td>-.130</td>
<td>-.243**</td>
<td>-.170**</td>
<td>-.070</td>
<td>-.014</td>
<td>.195**</td>
<td>-.063</td>
<td>-.137*</td>
<td>-.052</td>
<td>.097</td>
<td>.022</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>length of operation</td>
<td>.442**</td>
<td>.478**</td>
<td>.501**</td>
<td>.538**</td>
<td>.420**</td>
<td>.081</td>
<td>-.203**</td>
<td>-.068</td>
<td>-.002</td>
<td>-.578**</td>
<td>-.195**</td>
<td>-.054</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>living with partner</td>
<td>.347**</td>
<td>.041</td>
<td>.110</td>
<td>.032</td>
<td>.037</td>
<td>.009</td>
<td>.070</td>
<td>.111</td>
<td>-.034</td>
<td>-.144*</td>
<td>-.087</td>
<td>.157**</td>
<td>.146*</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>nil opioid analgesia</td>
<td>.022</td>
<td>.249**</td>
<td>.130*</td>
<td>.087</td>
<td>.055</td>
<td>-.075</td>
<td>-.076</td>
<td>.027</td>
<td>-.118*</td>
<td>-.138*</td>
<td>.086</td>
<td>-.093</td>
<td>.109</td>
<td>.023</td>
<td>1.0</td>
</tr>
</tbody>
</table>

* = p<.05 level (2-tailed)
** = p<.01 level (2-tailed)
From Table 12 (p.71), those variables that were correlated to the dependent variable were identified and included in the regression analyses. These included sociodemographic variables (age, gender, NESB/ESB, insurance) and clinical variables (analgesic mode, health status, postoperative complications).

Table 13 demonstrates those variables that were retained in the model throughout the step-wise procedures.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1 (Sociodemographic)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.007984</td>
<td>.002</td>
<td>.323*</td>
</tr>
<tr>
<td>Gender</td>
<td>.08406</td>
<td>.043</td>
<td>.125*</td>
</tr>
<tr>
<td>Insurance</td>
<td>-.02366</td>
<td>.062</td>
<td>-.025</td>
</tr>
<tr>
<td>NESB</td>
<td>-.221</td>
<td>.049</td>
<td>-.287*</td>
</tr>
<tr>
<td><strong>Step 2 (Clinical)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analgesic mode</td>
<td>-.365</td>
<td>.046</td>
<td>-.517*</td>
</tr>
<tr>
<td>Healthy vs nonhealthy by ASA</td>
<td>.01046</td>
<td>.047</td>
<td>.014</td>
</tr>
<tr>
<td>Postop complications</td>
<td>-.01990</td>
<td>.119</td>
<td>-.010</td>
</tr>
</tbody>
</table>

Note. $R^2 = .18$ for Step 1; adjusted $R^2 = .36$ for Step 2

* $p < .05.$

Table 14
Analysis of Variance for Regression Model in Table 13

<table>
<thead>
<tr>
<th></th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>7</td>
<td>8.809</td>
<td>1.258</td>
</tr>
<tr>
<td>Residual</td>
<td>202</td>
<td>14.363</td>
<td>.071</td>
</tr>
</tbody>
</table>

$F = 17.699$, Significance$=.000$, $n=209$
From the initial analyses, the simplest possible model derived from variables that were significant from the original analysis was formed and tested. Variables such as age, gender, language spoken (NESB or ESB) and analgesic mode were included in the regression analysis. Multicollinearity (i.e. tolerance value < .9) was detected in two of the variables included (age and analgesic mode). One of these (age) was removed and the regression analysis was recomputed. Results of this analysis are shown in Table 15.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 (Sociodemographic)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>.07724</td>
<td>.040</td>
<td>.115*</td>
</tr>
<tr>
<td>NESB</td>
<td>-.152</td>
<td>.046</td>
<td>-.247*</td>
</tr>
<tr>
<td>Step 2 (Clinical)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analgesic mode</td>
<td>-.388</td>
<td>.035</td>
<td>-.549*</td>
</tr>
</tbody>
</table>

Note. $R^2 = .08$ for Step 1; adjusted $R^2 = .37$ for Step 2

* $p < .05$.

Table 16
Analysis of Variance for Regression Model in Table 15

<table>
<thead>
<tr>
<th></th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>3</td>
<td>11.074</td>
<td>3.691</td>
</tr>
<tr>
<td>Residual</td>
<td>263</td>
<td>18.419</td>
<td>.07003</td>
</tr>
</tbody>
</table>

$F = 52.708$, Significance = .000
These analyses have demonstrated that some of the sociodemographic variables (gender, language spoken (NESB versus ESB)), and analgesic mode are important predictors of the total cumulative dose of opioid received by surgical patients; thus partially supporting Hypothesis 3.
Chapter 5

Discussion

Introduction
Pain management is a vital part of the postoperative care of surgical patients. Numerous social and clinical factors, discussed in previous chapters, have been identified as influencing the amount of analgesia either administered, or received, by surgical patients (Carroll, 1996; Carr, 1997; Carpenter, 1997; Dalton et al., 1999; Cheever, 1999). This study sought to explore only a small part of the possible factors that impact upon total opioid consumed by postoperative patients, that is, the impact of language and cultural diversity or ethnicity upon postoperative opioid consumption. In addition, the impact of ethnicity compared to other factors was also examined. This discussion will examine these issues, highlighting similarities and differences between this study and other researchers’ findings.

Sample Characteristics
Overall, the subjects in this study appeared to be representative of the population of South Western Sydney Area Health Service. The proportion of subjects who were non-English speaking (25.5%) was similar to the 26.3% of people recorded as non-English speaking in the SWSAHS (South Western Sydney Area Health Service, 1995). The mean age of the sample was 37.48 years (standard deviation 13.42 years) which is considered to be relatively young. This was a result of the 18 to 65 year age range for the sample (that is, exclusion of ‘older old’) and the high proportion of subjects (58%) requiring an appendicectomy – a procedure that can be required at
any age, but is more likely to be performed in young males (Copstead & Banasik, 2000). The younger age of the sample was also a result of the young population seen in SWSAHS (25.5% aged less than 15 years compared with 21% for Sydney) ((Webster, 1996). The age range and mean age of subjects in this study was comparable to similar studies (Stretzer & Wade, 1981)(McDonald, 1994); (Ng et al., 1996)a; (Ng et al., 1996)b; Stretzer & Wade, 1981; (Todd et al., 1993); (Woodhouse & Mather, 1997)), allowing for comparison of this study’s results with those of other researchers.

The mean dose of morphine consumed in the first 24 hours during the postoperative period was 33.44 mg with a standard deviation of 27.26 mg. The significant variability in consumption was further indicated by the range of doses. Eleven subjects consumed no morphine during the initial 24 hour postoperative period, while 7 subjects consumed doses in excess of 100 mg/24 hours (110 mg to 164 mg). Whilst the variability in consumption of morphine is noteworthy, it is not unexpected in light of the highly individual pain response (McCaffery & Pasero, 1999) and the range of surgical procedures that these subjects have undergone.

Non-English speaking subjects were slightly older than English speaking subjects. Previous research has demonstrated an inverse relationship between age and opioid requirements with older patients requiring less opioid (Hall & Hall, 1996; Macintyre & Jarvis, 1995; Woodhouse & Mather, 1997). It is unlikely that the four year difference between these groups could account for the reduction in analgesia consumed by the NESB group, as the mean ages remained low (36.46 ESB, 40.49 NESB). NESB subjects were also more likely to be living with a partner. This may help explain the age difference (that is, people living with a partner are generally

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going to be married or in a de facto relationship and as a consequence, older than those not living with a partner, or single). One of the consequences of having a partner is that there is generally a higher degree of social support from one's spouse. This can be beneficial in terms of recovery from surgery (Wallston et al., 1983) and may result in a reduction in postoperative analgesia requirements (Gil et al., 1990), although no correlation was seen between these two variables in this study.

Gender differences were evident. The inclusion of the category ‘abdominal hysterectomy’ resulted in slightly more than half the sample (56%) being represented by females. Males consumed more opioid analgesia in the first 24 hours during the postoperative period (36.32 mg, SD 30.46) compared with females (31.18 mg, SD 24.34) (p < .05). This finding supports studies by Burns et al (Burns et al., 1989), McDonald (McDonald, 1994) and Calderone (Calderone, 1990). Males prescribed PCA also consumed significantly more analgesia than females prescribed PCA. This was similar to the results of a large study of 1010 patients by Macintyre and Jarvis (Macintyre & Jarvis, 1995) which demonstrated that males used statistically significantly more morphine in the first 24 hours after surgery compared to female patients (p < .01). Whilst researchers are unclear on exactly why males consume more opioid during the initial postoperative period, it is clear that body weight is not a factor (males tend to weigh more than females). Although opioid analgesics are frequently administered on a mg/kg basis, there is no evidence that links body weight and individual analgesic dose requirement (Preble et al., 1992). Health insurance, which was used as a proxy for socioeconomic status, did demonstrate some differences in the sample. There were proportionately more English speaking patients with private health insurance than seen in the NESB group. However, both

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groups still had a very low percentage with private health cover when anecdotal
evidence suggests a more modest national average of 70%. This is probably a result
of higher unemployment in SWSAHS (15% compared with 10% for NSW) and
could have been further compounded by the selection of NESB groups. For
example, the rate of unemployment is 40% in Lebanese and 45% in Vietnamese
populations (Webster, 1996).

From a clinical perspective, the groups were not different in terms of health status
(ASA status). However, more NESB patients experienced postoperative
complications than the English speaking group. This is an interesting finding in
itself, not previously reported on. Close scrutiny of the nature of the surgical
procedures undertaken by this sample found no major differences in the type of
surgery performed although slightly more major abdominal surgery was
demonstrated in the English speaking group. Due to the limited numbers in many of
the surgical procedures, it was not possible to explore particular procedures more
thoroughly.

Analgesic Characteristics and Consumption for English Speaking
and non-English Speaking Groups
Hypothesis 1 explored differences in the analgesic characteristics of the two groups
(ESB and NESB). Analgesic mode and type were not dissimilar in the groups. No
statistical difference was found, thus refuting Hypothesis 1 posing that differences
existed. There was also no difference in the commencement of oral analgesia for the
groups.

Further analysis, examining the total postoperative dose of morphine, the central
focus of this study, found that significant differences were present in the first 24 hour

Chapter 5
postoperative period ($p < .001$), continuing into the second 24 hour period or to 48
hours postoperative ($p < .001$), but disappearing thereafter. This supports the
hypothesis that significant differences in opioid consumed, within the first 48 hours
(in this case), were found with NESB surgical patients consuming considerably less
analgesia than their ESB counterparts. This finding is consistent with other
researchers’ results (Ng et al., 1996; Ng et al., 1996; McDonald, 1994; Cleeland et
al., 1997), but demonstrated for the first time in Australian populations.

Comprehensive Model to Predict Total Opioid Consumed Within
the First 24 hours of the Postoperative Period
Although many sociodemographic and clinical factors were explored, only a small
number remained significant. Overall, the total variance explained by the model was
37% ($R^2$ from the final model) ($p < .001$), supporting in part, Hypothesis 3.
The variance explained, or not explained, suggests that there are several factors that
are not present in this model, that contribute to analgesic consumption by surgical
patients during the postoperative period. The following variables were significant:
gender ($\beta = .131$), language spoken at home (ESB or NESB) ($\beta = -.198$), and
analgesic mode ($\beta = -.549$).

Analgesic mode was the most powerful predictor of analgesic consumption and was
negatively associated with total opioid dose, as IMI was explored with total opioid
dose. It is reasonable to propose that the converse is also true: PCA is associated
with higher cumulative dose of morphine. This is consistent with other researcher’s
work (McGrath et al., 1989; Williams, 1996) where prescription of PCA results in
increased consumption of opioid. Age was not related to total opioid consumed in
the final model. Although there was a correlation between and total morphine dose

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consumed it was positively associated, or as age increases so does opioid consumed. This is not consistent with previous research findings (Belville et al., 1971); (Kaiko, 1980) whereby opioid consumption decreased with age. This finding was probably a result of the low mean age of this sample.

Gender was significant at the .05 level and demonstrated a positive relationship, with males consuming increased amounts of analgesia. Gender, previously discussed in this section, had highlighted that males used more analgesia than females. This was consistent with these previous findings (Hall & Hall, 1996; Macintyre & Jarvis, 1995; Woodhouse & Mather, 1997).

Health insurance status did not influence analgesic consumption and therefore did not support Hypothesis 3. Whilst the literature is limited in this area, there is some evidence that people from lower socioeconomic groups are administered more analgesia during the postoperative period (Davitz et al., 1977; Douglas, 1995). The very small proportion of patients with private health insurance may have contributed to this finding.

Ethnicity was found to be a predictor of analgesic consumption in the postoperative period, with inability to speak English being negatively related to analgesia consumed, or resulting in less analgesia being consumed. Whilst a significant difference between groups for analgesic consumption was demonstrated earlier, this study did not examine likely reasons for such a difference. Gender differences are unlikely to account for this difference, as both groups (ESB and NESB) had similar proportions of males and females. Whilst there is evidence to suggest that nurses' attitudes may result in inadequate analgesia in culturally and linguistically diverse groups (Douglas, 1995), this is unlikely to be a factor in the present study. The

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NESB group prescribed patient-controlled analgesia (PCA) could, theoretically, self-administer as much opioid as the ESB group that was prescribed PCA. However, this group still used significantly less morphine during the postoperative period (approximately 60% of the English speaking PCA group). Perhaps, the predominant language groups, being Vietnamese and Arabic, represent more stoic beliefs about how pain should be managed or responded to from the patient’s perspective (D'Avanzo, 1992; Walker et al., 1995; Ludwig-Beymer, ). Further examination of specific language groups is warranted, although difficulties in obtaining sufficient numbers are ever present. Another possibility may be differences in opioid metabolism.

Evidence from clinical studies demonstrates differences between the metabolism of opioids in Caucasians and Asians (Lee et al., 1997; Yue et al., 1989; Zhou et al., 1993). Whilst this may help explain a reduction in analgesic consumption in the Vietnamese subjects, it is unlikely to affect the Lebanese/Arabic and Italian subjects who also made up the NESB group. Therefore, differences in opioid metabolism are unlikely to be a significant factor in the reduced consumption of morphine seen in the NESB group. Additionally, other different cultural attitudes toward pain may have contributed to this finding.

As noted before, the mode of analgesia administration was found to be the most powerful predictor of morphine consumption throughout the postoperative period, with receipt of IMI analgesia being associated with lower analgesia consumption. Both ESB and NESB groups who were prescribed PCA consumed two and a half times the amount of analgesia consumed by the IMI group. The issue of total quantity of analgesia used when PCA is compared with the traditional intramuscular
method of administration seems open to question. Several studies have shown that patients using PCA may use less analgesia over time than patients on traditional regimes (Bennett et al., 1982). However, this study supports the findings of Owen et al. (Owen et al., 1986) who found that patients utilising PCA used more analgesia than patients prescribed IMI analgesia, and that morphine doses in excess of 100 mg/24 hours were not rare.

An explanation for the remarkable difference seen in analgesic consumption could be that subjects prescribed PCA were more likely to have undergone extensive surgery, whilst the IMI group were more likely to have had less extensive surgery, such as appendicectomies. Similarly, no significant difference was found in the proportions of ESB and NESB patients that received PCA versus IMI analgesia.
Other Issues

Whilst some patients consumed a significant amount of analgesia in the postoperative period, almost 10% of subjects in this study received no analgesia. This finding did not reach significance, but it is still of concern that 2.9% of English speaking and 7% of non-English speaking patients had no pain relief. This may be explained in part by the fact that all of these patients had undergone appendicectomies. Interestingly, all of the NESB patients in this grouping were Vietnamese and male.

Length of operation and health status (as measured by ASA status) did not explain the total dose of opioid consumed within the first 24 hours following surgery and therefore, did not support Hypothesis 3. The findings from this study in relation to these two factors do not support the findings of other researchers (Carpenter, 1997; Preble et al., 1992). Whilst no relationship between development of postoperative complications and consumption of opioid in the first 24 hours following surgery was demonstrated (Hypothesis 3) surgical patients from NESBs were found to be more likely to develop postoperative complications.

No relationship was demonstrated between length of hospitalisation and analgesic consumption. This finding does not support studies which suggest that adequate analgesia results in a reduction in length of hospitalisation (Egbert et al., 1990; Wasylak et al., 1990). However the adequacy of pain relief is somewhat undefined and unknown in this study but is assumed to be reflected in the PCA dose consumed by the patient. A relationship between length of hospitalisation and analgesia may have been difficult to determine because of the young sample, and the fact that over
half the procedures were appendicectomies usually characterised by very short stays in acute hospital facilities.

Differences across hospitals were noted for mode of analgesia, mean dose of IMI morphine in the first 24 hours and language group (ESB/NESB). More than half (54.5%) the subjects at Hospital 4 were prescribed patient-controlled analgesia, compared with 18.8% of patients at Hospital 3 and 26% of patients at Hospitals 1 and 2. This is likely to be a reflection of the more extensive surgery performed at Hospital 4, a tertiary referral hospital and the provision of an Acute Pain Service. Hospitals with an Acute Pain Service are more likely to utilise patient-controlled analgesia and to focus on pain management (Windsor et al., 1996; Macintyre et al., 1990). The low percentage of PCA utilisation at Hospital 3 may be a reflection of lack of equipment (pumps) or may reflect the preferences of staff surgeons or anaesthetists.

Despite the difference in mode of administration, similar doses of morphine were consumed in the first 24 hours at Hospital 2 (36.12 mg, SD 23.52) and Hospital 4 (37.90 mg, SD 31.66). More than half the patients at Hospital 4 received their analgesia via PCA (self administered). To consume a similar level of morphine via the IMI route (as was the case), Hospital 2 patients would have needed to make more requests for analgesia, or be offered analgesia more frequently. The higher proportion of English speaking patients at Hospital 2 (96.8%) may have had a bearing on this.
Limitations

The findings of this study need to be interpreted in light of the following limitations.

This study was conducted on the premise that both the medical records and the extracted data were valid and reliable. However, confirming the accuracy of the content of the medical records was beyond the scope of this study and it was therefore accepted that entries recorded by clerical, nursing and medical staff were an accurate reflection of patient events.

Patients with cardiac, hepatic or renal dysfunction, and patients who received regular oral analgesic drugs preoperatively were not excluded from the study. These factors are known to alter opioid requirements. In addition, use of local anaesthesia (e.g. wound infiltration) and intraoperative analgesics (e.g. rectally administered NSAIDs) was not recorded. If present, these factors could influence postoperative opioid requirements. The site of intramuscular injection was also not controlled for, a factor noted to influence absorption of opioid.

This study was also unable to control for alternative methods of analgesia (i.e. non parenteral or oral). The use of heat and cold, massage, transelectrical nerve stimulation, or other techniques to relieve pain were not taken into consideration.

Language used at home is an accepted measure of cultural and linguistic diversity or ethnicity and because of its availability in the medical records, was utilised for this study. However, language is only one aspect of culture or ethnicity, and relying exclusively on this measure may have resulted in inaccurate classification of individuals (that is, these individuals may have classified themselves as members of a different cultural and linguistic group).
This study has examined a very young group of surgical patients and these findings may not be found in other studies of older surgical patients.

Conclusions

*Implications for clinical practice*
Both sociodemographic and clinical variables have been demonstrated as important predictors of the consumption of opioid during the postoperative period. To this author’s knowledge, this is the first time these findings have been demonstrated in Australian populations. Of these factors, language spoken, gender and the mode of administration were related to the subsequent consumption of opioid. These factors accounted for 37%, a considerable amount of the variance, in the mean dose of morphine consumed during the initial 24 hour postoperative period. This suggests that nurses and medical staff need to consider these factors when administering or evaluating the effectiveness of analgesia during the postoperative period. Similarly, nurse academics need to ensure that education programs include some discussion on these factors in undergraduate programs. Only further research into specific cultural groups will allow for further clarity of exactly how best to assist NESB patients in obtaining appropriate pain relief, if indeed, it can be said that receiving less than ESB patients is in fact, an indicator of inadequate relief from the NESB patient perspective.

Perhaps one of the more striking features regarding the pain literature is the consistent inconsistency. The literature is not clear on the influence of ethnicity or cultural and linguistic diversity on analgesic consumption. The findings of this study, however, support previous research that suggests patients from linguistically diverse groups (NESB) consume less analgesia than their dominant culture.
counterparts (in this case, ESB). This finding was evident in both the NESB intramuscular analgesia group and the NESB patient-controlled analgesia group. The reduced consumption in both modes is significant, as it excludes language barriers as a reason for the reduced consumption of opioid (assuming the concept of PCA has been understood by the patient). This does suggest that cultural interpretations of pain and how that should be managed may be an important area of consideration. The relationship between reduced consumption of opioid and increase in postoperative complications requires further investigation in specific NESB patient groups.

It was also clear from this study that, when given the opportunity to self administer analgesia, both ESB and NESB patients used more opioid than the patients prescribed analgesia by the intramuscular route. This suggests that patients in the PCA group either used too much analgesia or, the more likely explanation, that patients in the IMI group received inadequate analgesia. The need for nursing and medical staff to be vigilant in their assessment of pain in the postoperative patient, is once again being raised by this study. It may be that PCA patients provide interesting models of analgesia usage that could be used by clinical staff in gauging the amount of IMI analgesia required by other patients. That is, the level of pain relief present for patients with PCA may be used as a level to be achieved in other patients receiving IMI analgesia. Similarly, it may be that if at all possible, PCA should be considered as the preferred mode of analgesic administration for surgical patients. This would require further investigation.
Gender was the final factor found to exert a significant influence on analgesic consumption, with males consuming more opioid than females. Once again, this information is important from both a prescribing and administration perspective. Males may require more analgesia than females, and sufficient analgesia needs to be prescribed and administered as required. This notion may also influence choice of administration mode with PCA being preferred. The gender difference demonstrated in this study also suggests that women may be at risk of inadequate analgesia. Consideration should be given to reinforce the need to individualise patient management practices, including administration of analgesia, and to avoid labeling or stereotyping patients according to cultural or ethnic group and gender.

Finally, although not the focus of this study, hospital differences were evident, particularly in relation to mode of analgesia and total dose of morphine during the initial 24-hour postoperative period. Hospitals with specialised services such as an Acute Pain Service used more PCA, which delivered higher doses of analgesia. Specialised services would seem to contribute to an increased likelihood of surgical patients receiving adequate pain management. Perhaps these results also suggest that specialised pain services are a necessity for all acute surgical hospitals.

**Implications for future research**
Classification of an individual as a member of a single cultural or ethnic group is notoriously difficult, particularly when the individual’s parents come from different backgrounds. Further studies that examine the effect of cultural and linguistic diversity on aspects of pain management could allow patients to self-classify, which may help ensure validity of cultural or ethnic groups. Reduced consumption of opioid in NESB patients using PCA suggest that staff behaviour or attitudes are less
likely to have influenced analgesic consumption. Therefore, future studies could examine patient behaviours and attitudes about pain, its meaning and management. This may provide insight into the differences seen in analgesic consumption.

Culturally-specific pain rating scales could be used in conjunction with analgesic consumption to help explain the variability in the consumption of opioid during the postoperative period. The use of non-pharmacologic methods to relieve pain could also be explored and may be more appropriate and more familiar to specific cultural groups.

Finally, replication of this study is recommended. Similarly, studies of surgical patients undergoing other forms of surgery (other than abdominal surgery) need to be undertaken to confirm or refute these findings in different populations.

Pain may have a positive effect in reducing activity and allowing for healing to occur following surgery. Pain management remains the cornerstone of caring for surgical patients.

Adequate pain relief, during the postoperative period, enables such healing to occur and contributes to a successful outcome for the patient. Health staff and patients, with increased knowledge about the factors (cultural and gender issues) that influence the amount of analgesia required, for diverse patient groups, are able to appropriately contribute to their recovery with minimal or no complications. Furthermore, as cultural interpretations of pain and pain management unfold, a recognition of specific cultural influences on pain and subsequent recovery will become more evident.
APPENDIX A
Data Collection Tool

Date of admission: ............................................
Date of discharge: ..........................................

Date collected by: ............ (Initials)

POSTOPERATIVE ANALGESIA DATA

1. Gender
   Male ............................................... ☐ 1
   Female........................................... ☐ 2

2. Age: ..............................................

3. Marital Status:
   single.............................................. ☐ 1
   married/defacto.................................. ☐ 2
   div/sep............................................ ☐ 3
   widowed.......................................... ☐ 4

4. Country of Birth
   Australia........................................ ☐ 1
   Not stated....................................... ☐ 2
   Other (state).....................................

5. Language spoken at home
   English............................................. ☐ 1
   Not stated....................................... ☐ 2
   Other (state).....................................

6. Insurance
   Public............................................. ☐ 1
   Private.......................................... ☐ 2

7. Procedure
   ICD-9 [45.7]...................................... ☐ 1
   ICD-9 [46.0 - 46.9].............................. ☐ 2
   ICD-9 [47.0 - 47.9].............................. ☐ 3
   ICD-9 [48.5]...................................... ☐ 4
   ICD-9 [51.2]...................................... ☐ 5
   ICD-9 [68.3 -68.6].............................. ☐ 6

8. Postop complications
   unplanned return to OR....................... ☐ 1
   hospital-acquired postoperative
     wound infection................................ ☐ 2
   hosp acquired bacteraemia.................... ☐ 3
   other (state)....................................

9. Date of operation: .....................................

10. Operative time (hrs).................................

11. ASA status
    Healthy patient............................... ☐ 1
    Mild systemic disease........................ ☐ 2
    Severe systemic disease..................... ☐ 3
    Severe-life threatening..................... ☐ 4
    Moribund....................................... ☐ 5
    Emergency operation.......................... ☐ 6
    Trauma......................................... ☐ 7

12. Analgesia-mode
    PCA................................................ ☐ 1
    PRN............................................... ☐ 2

13. Analgesia-type
    morphine........................................ ☐ 1
    pethidine...................................... ☐ 2
    other (state)...................................

14. Analgesia-cumulative dose
    0-24hrs (Day 0).................................
    25-48hrs (Day 1)...............................
    49-72hrs (Day 2)...............................
    73-96hrs (Day 3)...............................

15. Commencement of first non-opioid
    0-24hrs. (Day 0)................................ ☐ 1
    25-48hrs. (Day 1).............................. ☐ 2
    49-72hrs. (Day 2)............................. ☐ 3
    73-96hrs. (Day 3)............................. ☐ 4

16. Hospital
    Bankstown...................................... ☐ 1
    Campbelltown.................................. ☐ 2
    Fairfield....................................... ☐ 3
    Liverpool..................................... ☐ 4
APPENDIX B
Certificate of Approval: UWS Macarthur

UNIVERSITY OF WESTERN SYDNEY, MACARTHUR

ETHICS REVIEW COMMITTEE
(HUMAN SUBJECTS)

CERTIFICATE OF APPROVAL

Date: 30 May, 1995

Investigator: Bronwyn Everett
Contact Address: Faculty of Health
UWS Macarthur
Bankstown Campus

Telephone: (02) 772 9368
Fax No:

Project Title: The effect of an education program on nurses' knowledge and attitudes towards pain management and frequency of narcotic analgesic administration.

Protocol No.: 93/37

The Ethics Review Committee (Human Subjects) has approved the above protocol.

The Principal Investigator is required
a) to provide an Annual report on matters including
   * security of records
   * compliance with approved consent procedures and documentation
b) to report to the Committee immediately anything that might affect ethical acceptance of
   the protocol, including
   * adverse effects on subjects/participants
   * proposed changes in the protocol
   * unforeseen events that might affect continued ethical acceptability of the project.

The protocol is approved until 31 December 1995 subject to the protocol complying with the above.

It should be noted that it is the responsibility of the Investigator for ensuring ethical practice in
 research and for compliance with the above.

The above Protocol number must be quoted in all future correspondence regarding this protocol.

Professor Warwick Wilson
CHAIR
ETHICS REVIEW COMMITTEE (HUMAN SUBJECTS)
Ms. B. Everett,
Lecturer,
Faculty of Health,
UWS Macarthur,
P.O. Box 555,
CAMPBELLTOWN NSW 2560

Dear Ms. Everett,

Re: The relationship between ethnicity and the provision of postoperative analgesia.

Thank you for attending the Ethics Committee meeting on Monday, 23rd June, 1997, with regard to the above study.

As you are aware, the Committee resolved that this was primarily a quality assurance study and therefore, formal Ethics Committee approval was not required.

However, would you please ensure that the strictest levels of confidentiality are maintained at all times.

Yours sincerely,

[Signature]

EMERITUS PROFESSOR A. LYKKE,
Chairperson,
SWSAHS Research Ethics Committee.

For: Mr. Ken Brown,
Chief Executive Officer.

Shaping a Healthier Future

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Cullen, D. J., Nemeskal, A. R., Cooper, J. B., & et al. (1992). The effects of pulse oximetry, age and ASA physical status on the frequency of patients admitted unexpectedly to a post-operative intensive care unit and the severity of their anesthesia related complications. Anesthesia and Analgesia, 74(2), 181-188.


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The impact of linguistic diversity on postoperative opioid consumption

by

Bronwyn L Everett

A thesis
presented to the
University of Western Sydney Macarthur
in partial fulfilment of the requirements
for the degree of
Master of Science (Hons) Health

March, 2000

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PLEASE NOTE

The greatest amount of care has been taken while scanning the following pages. The best possible results have been obtained.
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Dedicated to my mother, Margaret
Acknowledgements

This thesis would never have been possible without some wonderfully supportive family, friends and colleagues.

To Professor Maree Johnson, who generously shared her time and experience.

Thankyou for “going the extra mile”.

To my husband Greg, and children, Nathan, Elizabeth and Joshua. You make it all worthwhile.

To my dearest friends, Jena and Yenna. Words can never express my gratitude for all your help — the practical support, from cooking meals and childminding to the very time-consuming formatting of this thesis, were all appreciated. But what I appreciate most was the time you spent in prayer, both for me and the completion of this thesis.

To Deborah, Judith, Richard, Alessandra and Petra. A big thankyou for your contribution.

And to my work colleagues, especially Lyn, who have “been there” and lent support and encouragement when needed.

But they that wait upon the LORD shall renew their strength; they shall mount up with wings as eagles; they shall run and not be weary; and they shall walk, and not faint.

Isaiah 40:31
Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or in part, for a degree at this or any other institution.

(Signature)
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Abstract

Pain management is a critical part of the care of the surgical patient. This study sought to investigate the impact of cultural and linguistic diversity on analgesic administration practices and opioid consumption during the postoperative period. A retrospective medical record audit of 278 English-speaking and non-English speaking surgical patients (mean age 37.5 years) was carried out at four hospitals in Sydney’s South West. No differences were found in the type of analgesia prescribed, the mode of analgesia, or the commencement of oral analgesia between the two groups. However, non-English speaking patients consumed less analgesia during the initial postoperative period (0-48 hours) than their English speaking counterparts (p < .001). The importance of this difference was further examined within the context of a range of factors known to influence analgesia consumption. A model including sociodemographic and clinical factors—mode of administration of analgesia (β = -.54, gender (β = .13) and language spoken (β = -.20)—predicted 37% of total opioid consumption. Although mode of administration (IMI medication associated with less analgesia) was the most important factor, being of non-English speaking background (NESB) also contributed substantially. Pain assessment, inclusive of gender and cultural nuances is recommended. The need for further research into pain interpretation in specific linguistic and cultural groups is highlighted.