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Decreasing pain and length of stay in the Post Anesthesia Care Unit, (PACU), by
Implementing the ASPAN Pain and Comfort Guidelines

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Decreasing pain and length of stay in the Post Anesthesia Care Unit, (PACU), by
Implementing the ASPAN Pain and Comfort Guidelines

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Poorly managed pain in the immediate postoperative period frequently extends the patient's length of stay in the post anesthesia care unit (PACU) and may lead to increased costs for an organization. Evidence-based clinical practice guidelines are emerging as one means to improve pain management practices. The American Society of PeriAnesthesia Nursing (ASPAN) Pain and Comfort Guidelines were developed to fill the gap for perioperative nursing pain management practices within the perioperative continuum (Krenzischek & Wilson, 2003). The overall objective of this project is to decrease PACU length of stay (LOS), related to pain, by improving the pain management performance of nurses in the PACU through the implementation of the ASPAN Pain and Comfort Guidelines. The specific aims of this project are to:

Aim 1: Evaluate the impact of implementing the American Society of PeriAnesthesia Nursing (ASPAN) pain and comfort guidelines in a PACU

Aim 2: Compare the differences in patient length LOS stay in the PACU pre and post implementation of the ASPAN pain and comfort guidelines.

Aim 3: Determine the cost-effectiveness of implementing the ASPAN pain and comfort guidelines in the PACU

This pre and post implementation outcome project was conducted in a hospital that performs surgery on, approximately, 800 patients per month. Descriptive statistics was used

to analyze the data obtained from this project. The findings show that the overall pain rating at time of discharge decreased post implementation; increase documentation of patient/family pain management education; and there was a decrease in PACU LOS from 2.95 hours pre-implementation to 1.70hrs post-implementation. Furthermore, expansion of this project may lead to a greater realization in cost savings related to a sustained decrease in the LOS.

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Chapter 1

Acute post-operative pain and its management have been widely researched (Summers, 2001). Unfortunately, it is an area that has shown little improvement with regards to nurses' knowledge and attitude towards pain management and there has been poor utilization of pain management guidelines to guide practice, resulting in under-treated pain. Nurses are in a unique position, due to their close proximity and length of exposure to patients, to make adequate and appropriate assessments to collaborate with licensed independent providers (LIP) in formulating an effective pain management plan. However, "poorly managed" pain has a number of negative outcomes. It can result in adverse physical and psychological consequences, an increase hospital length of stay (LOS) and, may negatively impact patient satisfaction scores (Shang & Gan, 2003; Kehlet, Jensen & Woolf, 2006; McMain, 2010). Another key aspect that impacts pain management negatively is the variability in pain management practices which, Krenzischek (2004) found is reduced by the use of clinical practice guidelines to manage pain.

The issues with pain management occur in many clinical settings, but the concept of nurses being the "gatekeepers" of effective pain management is more relevant in the Post Anesthesia Care Unit (PACU) setting. It is generally known and expected that patients will experience pain after surgery and more so upon emergence from anesthesia (Blakely & Page, 2001; Brown, 2008). Thus, it is the PACU nurses' duty and responsibility to immediately manage the patients' acute pain. In so doing, the PACU nurse has to appropriately assess,

provide interventions, and evaluate the outcomes of pain management on a frequent basis (Krenzischek, Windle, Mamaril, 2004). However, research shows that pain management is not occurring in this organized fashion resulting in the various negative afore mentioned outcomes (Krenzischeket al., 2004; Summers, 2001).

Additionally, the clinical management of pain is mitigated by the knowledge and attitude of nurses towards its alleviation, thereby hindering standardization in the approach and practice of pain management. Evidenced based clinical practice guidelines are emerging as one means to improve pain management practices. The American Society of PeriAnesthesia Nursing (ASPAN) is the body that sets forth guidelines that help govern perianesthesia nursing. They, in 2003, developed the ASPAN Pain and Comfort Clinical Guidelines in response to Joint Commission's mandate that every patient has a right to effective pain management (Krenzischek et al., 2004). If the guidelines were to be implemented, it could potentially standardize the pain management practices of nurses in the PACU setting.

The overall objective of this project is to decrease pain and PACU length of stay (LOS), related to pain, by improving the pain management performance of nurses in the PACU through the implementation of the American Society of PeriAnesthesia Nursing (ASPAN) Pain and Comfort Guidelines.

The specific aims of this project are to:

Aim 1: Evaluate the impact of implementing the American Society of PeriAnesthesia Nursing (ASPAN) Pain and Comfort Guidelines in a PACU on:

A. number of PACU nurses who were educated about the ASPAN guidelines

(total nurses, n=30 or 80% n=24))

B. PACU nurses use of the ASPAN guidelines in 60% of the PACU patient population as demonstrated by:

1. Increase use of evidence-based pain practices (NSAID, adjuvant, nonpharmacologic, patient and family education)
2. Change in the balance of medications used (decrease in Fentanyl use and an increase in Dilaudid and Ketorolac use)
3. The effects of the nurses' pain management practices as reflected in patient pain scores pre versus post implementation of the ASPAN guidelines using a 0-10 numeric scale.

Aim 2: Compare the differences in patient length LOS stay in the PACU pre and post implementation of the ASPAN pain and comfort guidelines.

Aim 3: Determine the cost-effectiveness of implementing the ASPAN pain and comfort guidelines in the PACU as reflected by:

A. Extended LOS due to pain as a reason

B. Use of medication (Fentanyl and Dilaudid)

The following discussion will review the literature to give a rationale for the contributing factors to poor pain management followed by a description of the problem in the practice setting.

Rationale

There is an extensive body of literature that examines the issues associated with postoperative pain management. In the review of the literature, there were three themes that

emerged that relate to the description of the above problem, specifically: 1) identifying gaps in the knowledge of nurses about pain pharmacology; 2) the attitude of nurses managing pain; and 3) the need for pain management guidelines.

Gaps in knowledge

It is important to first discuss the deficiency in nurses' knowledge of pain management in the areas of assessment and opioid use. During her study to determine nurses' assessment capabilities, Mackintosh (1994) realized that nurses had pain management knowledge deficits. She found that 47% (N=29) of the nurses surveyed were not in agreement with the patient's report of their pain. She also found that 72% (N=44) of the nurses made imprecise assessments of patients' pain and 87% (N=53) of the nurses felt that they consistently underestimated the amount of pain that the patients experienced (Mackintosh, 1994). These percentages give a glimpse into the inadequate self-awareness and reliance nurses have with the pain assessment process.

Furthermore, Twycross (2002) consistently found during her systematic review that the overall lack of knowledge in pain management stems from the lack of pain management education in nursing schools. Further evidence to highlight nurses lack of education with pain management are the results from the survey that Xue et al. (2007) conducted where 60% (N=30) of oncology nurses surveyed rated their education and training in cancer pain as fair, 20% (N=10) rated it as poor, 16% (N=8) rated it as good and 4% (N=2) rated it as excellent. Taking a closer look at education Twycross (2002), stresses that there should be a wide understanding that learning both involves development of new skills, and it involves understanding or changing an attitude that results through periods of reflection. Therefore, Twycross, (2002) proposes that pain management principles should be "incorporated into

nurse education by the adoption of student-centered teaching strategies which encourage deep approaches to learning” (p. 708).

Nonetheless, there are gaps in the nurses’ ability to effectively assess pain. The cardinal rule in pain management is to first accept the patient’s report of pain as a measure of their pain intensity (McCaffery & Ferrell, 1999). Two studies noted that nurses were hesitant to accept a patient’s report of pain and were averse to administer opioids to patients who did not “appear” to be in pain (Mackintosh, 1994; Horbury, Henderson, & Bromley, 2005). This highlights the lack of knowledge and understanding that there are both physical and behavioral aspects to how pain is expressed (McMain, 2010). In addition, Idvall, Berg, Unosson, & Bruding (2005) found that patients reported a significantly higher pain score than what was documented by the nurses ($P < 0.02$). Clinically, this is significant to show that a patients’ pain may often be under treated

Moreover, in reference to opioid usage, McCaffery & Ferrell (1999), found other pain knowledge deficits from their research that showed 75.9% (N=342) of nurses surveyed connected addiction to opioid to the length of time on opioids. Also they found that 53.2% (N= 239) of nurses reluctantly medicated patients adequately because of their concerns with over sedating the patients with opioids (McCaffery & Ferrell, 1999). These types of knowledge deficits are also shaped by attitudes towards pain management that can lead to under treatment of pain.

Attitudes of nurses

It is difficult to separate attitudes from knowledge when discussing pain management because knowledge, or lack of it, helps to shape attitudes. Attitudes derive from belief systems that have developed throughout the lifespan of an individual, and are fed by cultural

beliefs and life experience. These constellations of attitudes in due course may unsuitably modify the nurses' response to a patients' complaint of pain (McMillan et al, 2000). On occasion, in spite of the nurses' knowledge about pain, it is their attitude towards pain that may be the actual driver of their practice.

Other studies found that nurses were knowledgeable about certain aspects of pain management however their actions were not congruent with their message (Ardery, et al., 2003; Dihle, Bjolseth, & Helseth, 2006; McCaffery & Ferrell, 1999). Dihle et al. (2006), conducted a study where they observed nurses for 24 hours over a course of five shifts and found that there was a gap between what the nurses said they did when interviewed and what they were observed doing. It follows how McMillan et al. (2000), found in their study that 51% (N=112) of the nurses believed that their estimation of the patients' pain is more valid than the patient's estimation of their pain. Equally, Xue et al. (2007) found in their study of medical and gynecological oncology nurses that 59% (N=15) and 43% (N=10), respectively, believed that patients' frequently underestimated pain, but 12% (N=3) and 15%, (N=4) respectively, believed that occasionally they overestimated their pain. Again, this shows how nurses do not accept the patients' report of pain. Malek & Olivieri (1996) found that in two thirds of the patient records reviewed (N=23) the nurses failed to document pain assessment and reassessment or other non-pharmacologic treatments. This lack of information contributes to the inability to make appropriate decisions for effective pain management and it does not reflect the efficacy of nursing interventions.

Mackintosh (1994) makes a valid point by stating that "without a specific framework for pain management or adequate tools to assist in its assessment, nurses can only base their practice on the direction of their colleagues and the custom and practice of their ward area"

(p. 346). This is another example of an attribute that contributes to variability in the skill of pain management on a unit. It also further supports the need for implementing guidelines to create and foster uniformity in practice.

Pain management guidelines needed

To address the variances in the knowledge and attitude of nurses with regards to pain management, it is plausible that there is utility in implementing evidenced based guidelines to help guide practice. There has been increasing attention towards use of evidence-based practice which is a precursor to the development of practice guidelines. This increased attention has been demonstrated by the increase in guideline use in various health areas (Prior, Guerin, & Grimmer-Somers, 2008). These investigators argue that the use of clinical guidelines has the benefit of improving health care processes, outcomes and costs. Dulko (2007) defines clinical practice guidelines as “the elements of systematic formulations of documents of the best available evidence that are then used to assist practitioners to make informed clinical decisions” (p. 200). According to Dulko (2007) successful guidelines, should include the following aspects:

- “(1) Development based on evidence with the guideline formulated by key professionals; (2) dissemination to all involved healthcare professionals for critique;
- (3) Implementation with direct feedback on performance to providers, or general feedback on system performance; and
- (4) Accountability for performance according to the guidelines (p. 202)”

There are a number of benefits from the use clinical practice guidelines. The benefits include enhancing the capacity to link process to outcomes, showing the relationship between research and practice and the strong significance of research in practice (Dulko, 2007), and

allowing for the decline of unsuitable care, increased clinical efficiency, and better control of health care spending (Prior et al.,2008). These benefits will lead to the overall improvement of quality in healthcare.

Of equal importance is the process involved in the actual implementation of new guidelines into practice and mechanisms for sustainability. The intricacy of implementing evidence in clinical practice is noted in the emerging literature on knowledge translation (Kavanagh, Watson & Stevens, 2007). Dulko (2007) identifies in a systematic review of the literature that dissemination efforts and guideline effectiveness are hampered by implementation approaches that are not well-organized. Hahn (2009) purports that there are three processes involved in implementing guidelines, namely: “1) an explicit assessment of the strength of the best available medical evidence; 2) application of clinical judgment in the care of individual patients, and; 3) elicitation of patient preferences via shared decision making “(p. 364). Additionally, the tools used for implementation also require consideration to achieve maximal effectiveness.

There have been numerous methods or strategies used to implement guidelines into practice. Such methods include: educational strategies, e.g. educational meetings, outreach, and interactive educational strategies, audit/feedback/peer review, multifaceted interventions, mass media/distribution strategies, and reminder and decision support systems (Prior et al., 2008). Through an overview of secondary evidence, Prior et al. (2008) researched the effectiveness of these clinical guideline implementation strategies. They used the Assessment of Multiple Systematic Reviews (AMSTAR), to determine that the educational outreach, interactive education, multifaceted interventions, and the reminder system were amongst the most effective strategies. Meanwhile, traditional educational strategies and mass

media/distribution strategies were found to be ineffective (Prior et al., 2008). In further support of the multi-factorial strategy, Dulko et al. (2010) found that employing a multi-factorial method such as audit and feedback along with provider education yielded an 87% (N=96) compliance rate with their established clinical practice guidelines. Another version of a multi-factorial approach is the framework used by Kavanagh, Watt-Watson, & Stevens (2007), in the Promoting Action on Research Implementation in Health Services (PARISH) framework, whose purpose is to guide the design of strategies to implement evidence into practice. When applied to pain management this framework emphasizes the roles of context and facilitation in integrating acute pain management evidence into everyday nursing practice.

Clinical practice problem description

Currently, in the PACU at the project organization, an increased LOS is considered to be any amount of time greater than two hours for all inpatients. The reasons for an increased LOS are routinely monitored. Out of a list of 24 reasons for increase LOS, nurses are expected to indicate the reason why their patient stayed in the PACU greater than two hours. Since July 2009 to March 2010, the number one reason for increased LOS was bed availability at 41% (n=1184) and the second greatest reason was pain at 21% (n=606). As mentioned previously, nurses have the greatest exposure and proximity to patients to make adequate pain assessments that will contribute to the pain management plans. However, the range in the skill mix of all the nurses in this PACU; the absence of any guidelines; and their knowledge and attitudes, likely affected the relevant nursing care factors in pain management which may contribute to the variability in their implementation of pain management practices.

A closer look at perianesthesia nursing at the project organization gives some additional insight into other contributing factors to this variability in pain management practices. First, due to the nature of the pre-printed anesthesia pain management orders, there is a considerable amount of variability in how the orders are completed. There is no consistency in how many doses of each opioid medication the anesthesiologists order for controlling pain and rarely are there non-opioids ordered. The order set lack dose ranges that can be used for varying levels of pain. For example, one of the PACU discharge criteria is that a patient's pain must be less than 5 out of 10 on the 0-10 numeric pain scale (where 0=no pain, and 10=is worst pain ever felt). Therefore, if a patient is experiencing pain at 4 out of 10 the nurse is less likely to offer additional pain medication because they meet the criteria, but it may not be the patient's desired level of relief. Also, the pain orders do not provide an option for, or encourage, pain less than a five to be medicated. Thus, it is at the discretion of the nurse caring for the patient to probe further to meet the patient's pain relief goal.

Another example is the autonomy in the choice of pain medication. Usually, patients are medicated with either Fentanyl or Dilaudid (The trade names are being used because it was more familiar to the nurses at the project organization). Fentanyl has a short half-life but works immediately and Dilaudid has a longer half life and takes 5-10 minutes longer than Fentanyl to start working. Thus, depending on the nurses' philosophy they may choose to use the Fentanyl for its immediate effect properties, however due to its short half life the patient will require more and frequent doses (not optimal for inpatients that have had long surgeries (>2hours)). At the same time, some surgeries are known to be more painful than others and thus a longer acting pain medication would overall be more beneficial (McMain, 2010). However, some nurses still choose to use fentanyl extensively before switching to a longer

acting pain medication such as Dilaudid or Morphine. Another contributing factor is the lack of prompting from the current flow sheet to use non-pharmacologic methods (e.g. position change, hot/cold compresses, limb elevation, distraction, etc.) to aid pain management. The PACU flow sheet does not have an area to document non-pharmacologic measures employed to manage the patient's pain. So it is at the discretion of the nurse to use other comfort measures, but documentation is not completed to reflect that such actions were done. These examples highlight the lack of evidence being used by the nurses to guide their practice. Such examples suggest a strong need to implement and utilize pain management guidelines to guide practice. The process of implementing guidelines is equally challenging. Kavanagh, Watson & Stevens (2007) put it best when they said "Understanding the theoretical underpinnings of implementing evidence into practice is an important first step to improving pain relief ...by narrowing the gap between clinical practices and the research evidence supporting optimal acute pain management" (p. 305). It will be important to explore the role of informal leaders on the unit, the organizational structure and whether or not the organization has the infrastructure to support change, and the role of formal leadership on the unit. As discussed earlier, there are number of implementation strategies that are effective. The project will employ a multi-factorial strategy to aid in the implementation of the ASPAN pain guidelines. As a result, the Iowa model was chosen to implement the ASPAN Pain and Comfort Clinical Guidelines in the PACU in the project organization. Use of the Iowa Model in a hospital setting has its advantages because it stresses the importance of taking into account the entire healthcare system which incorporates the providers, patients, necessary infrastructure and their influence on incorporating evidence findings into practice (Dontje, 2010).

In summary, post-operative acute pain management still remains an area in need of EBP to better address the pain management needs of post-surgical patients. Significant contributing factors to the current problem are the gaps in knowledge, attitude of nurses, and the lack in use of EBP pain management guidelines. The ostensible significances of this project would be uniformity in pain management practices amongst nurses in the PACU setting; guidance for new nurses in the same setting; better control of acute post-surgical pain; decrease LOS in the PACU which would increase throughput, resulting in cost savings to the patient and the organization. Equally, this process will give some insight as to the necessary components for implementing guidelines in a large institution such as the location of the project organization.

Chapter 2

In the immediate post-operative phase, acute pain management is generally one of the top foci for a PACU nurse. Equally, pain management is the predominant focus of concern for patients, amongst the many adverse reactions that can occur after surgery (McMain, 2010). The expression of pain is influenced by physiologic, psychosocial, and cultural experiences which add to the complexity of managing pain (Shang & Gan, 2003). A closer look at the physiologic aspects of acute pain requires an understanding of its definition. Acute pain is defined as “a complex constellation of unpleasant sensory, perceptual, and emotional experiences and certain associated behavioral responses provoked by tissue damaging stimuli or disease process” (Blakely & Page, 2001, p. 167). There will be a discussion about the difference between acute and chronic pain. Thereafter, the discussion will involve the consequences of untreated or poorly managed pain; medications used to treat acute pain and some non-pharmacologic modalities; nursing related factors affecting pain management; the benefit of guidelines; the cost-effective analysis of guideline implementation; characteristics of the models that are guiding this project; and the expected outcomes.

Acute vs. chronic pain

There are a number of differences and similarities between acute and chronic pain. Acute pain is generally considered to be more physiologic in nature, whereas chronic pain follows a pathologic course (Blakely & Page, 2001). More specifically, physiologic pain is “characterized as transient, well localized, and generally proportional to the extent and

intensity of the noxious (potentially tissue-damaging) stimulus” (Blakely & Page, 2001, p. 168). It is believed that acute pain has protective qualities, namely awareness, to help prevent potential or further tissue damage; alternatively, chronic pain serves no physiologic function, rather it generates a depressive type response (Blakely & Page, 2001; Kehlet, Troels & Woolf, 2006). However, Blakely & Page (2001) indicate that acute pain, in a matter of a few hours, can evolve into pathologic pain (chronic pain) because of potential changes in neural tissue that are responding to internal environmental stimuli. Therefore, it is important to quickly manage acute pain, such as the pain that occurs in the immediate post-operative period.

Probing further at post-operative pain shows that it often involves pain that is caused by the inflammatory process that occurs with tissue damage like that of surgical incisions (Kehlet, Troels & Woolf, 2006). It follows then, that until the surgical incision has healed the inflammatory process will remain, thereby causing a constant source of pain. There are a number of physiologic side effects of pain because the experience of it can trigger certain catecholamine responses to include, “tachycardia, hypertension, increased respiratory rate and work of breathing, immuno-suppression, and decreased tissue perfusion as a result of catecholamine-induced vasoconstriction” (Blakely & Page, 2001, p. 177). Other physiologic symptoms include endocrine effects—catabolic and anabolic changes, decrease insulin production, reduction of testosterone; metabolic effects—raised blood sugar levels; and homeostasis—immobility, increased blood viscosity, hypercoagulability and risk for deep vein thrombosis (Dunwoody, et al., 2008, McMain, 2010).

Theories of pain

There are a small number of theories on the origination and processing of pain. The most notable and widely accepted theory of pain is the Gate-control theory of pain proposed by Ronald Melzack and Patrick Wall in 1965 (Craig, 2003; DeLeo, 2006; Melzack, 2005). Melzack (2005) further explores his gate-control theory and found that, although it holds true, it was not inclusive enough to explain all chronic pain mechanisms. Therefore, he proposed the Neuromatrix theory of pain.

gate-control pain theory.

The gate-control theory is an intricate interplay of three spinal cord systems believed to explain the experience of pain. Melzack and Wall (1965) proposed that an impulse or stimuli initiated at the level of the skin traveled through the spinal cord to the brain beginning with the substantia gelatinosa cells (gray matter) in the spinal cord that then moved to the dorsal-column fibers, whose signals venture toward the brain, and lastly, to the “first central transmission (T) cells in the dorsal horn” (Melzack & Wall, 1965, p974). They equate the substantia gelatinosa to the “gate-control” system that adapts the response from the stimulus before they influence the T cells. Secondly, they proposed that the response from the stimulus in the “dorsal column system act, in part at least, as a central control trigger which activates selective brain processes that influence the modulating properties of the gate control system” (Melzack & Wall, 1965, p974). Lastly, they state that the “T cells activate neural mechanisms which comprise the action system responsible for response and perception” (Melzack & Wall, 1965, p974). Essentially, this pain theory postulated that impulses

traveling into the body and down from the brain have the effect of opening and closing the neural gates within the spinal cord (Melzack, 2008).

With external sources of pain, the nociceptors (pain sensing cells) within this gate control system can be sensitized to release algogenic (pain causing) mediators such as prostaglandins which cause an inflammatory response (DeLeo, 2006). This activity supports the use of nonsteroidal anti-inflammatory drugs (NSAIDs). NSAIDs such as aspirin, ibuprofen, and Ketorolac, “decrease the production of sensitizing prostaglandins in patients who have acute inflammatory pain” such as that which occurs with a surgical incision (DeLeo, 2006, p. 59).

Gate closing or inhibitory pathways of pain, which are mainly noradrenergic (adrenergic antagonizing) and serotonergic (serotonin antagonizing) mediated, work to impede the release of pain causing substances in the substantia gelatinosa (DeLeo, 2006). DeLeo (2006) stated that “this (inhibition) is accomplished directly by interneurons and/or indirectly by the release of endogenous opioids” (p. 59). Herein lays the need for the use of opioid medications to inhibit pain.

Additionally, the gate control theory, because of its relationship with psychological factors, spawned new research of the brain (Melzack, 2008). As a result, drugs such as antidepressants and anticonvulsants were developed which provide considerable relief from chronic pain (Melzack, 2008). This gives credence for the use of medications like these, or adjuvant, as they are typically known, in conjunction with other types of pain medications to provide added relief of pain. Therefore, pain management plans that are multimodal to address pain from peripheral, spinal, and supraspinal sites may be more effective than a

singular approach (DeLeo, 2006). DeLeo (2006) describes the three areas of pain modulation best when she outlined them as follows:

- “1) attenuation or blockade of pain through intervention at the periphery with use of NSAID drugs, regional analgesia, or neural ablative procedures;
 - 2) activation of inhibitory processes that gate pain at the spinal cord and brain with use of opioids, α_2 -adrenergic agonists such as clonidine, or tricyclic antidepressants;
 - 3) the interference with perception of pain through complementary medicine (non-pharmacologic), psycho-therapy, hypnosis, relaxation techniques, and biofeedback”
- (p. 60).

Nevertheless, Melzack (2005) continued his studies about the origination and continuation of pain and later developed the Neuromatrix theory of pain that encompassed more of the psychological mediators of pain.

neuromatrix pain theory.

The neuromatrix theory was derived because, unlike acute pain which is known to be caused by a brief noxious stimuli with its translation mechanism well understood, chronic pain, unexplainably arises in spite of any visible injury or pathology which is not explained by the gate-control theory of pain (Melzack, 2005). The “neuromatrix” is a neural pattern that produces pain that is genetically generated and influenced by sensory experiences (Melzack, 2005). Visual, vestibular mechanisms (auditory and movement or balance), and cognitive processes are some of the sensory inputs that help lay patterns in the neuromatrix. It is the cyclical interplay of inputs and brain activity that create a neurosignature transmitted through nerve impulses that are converted into a continually changing stream of awareness of pain

(Melzack, 2005). Essentially, this theory gives credence to how pain is mediated by various environmental stimuli so treating pain immediately and effectively may decrease the patterns formed by this interplay that could create long term patterns that shape the patients' experience and response to pain. Equally, this theory also lends some insight to reason culture has an effect on the expression of pain. Nonetheless, minimizing pain expeditiously should be the goal of every nurse managing pain to abate the patterns of created in the neurosignature that lead to chronic pain development.

Consequences of untreated pain

Globally, pain management that is not adequate may result in an increase LOS in the PACU and hospital course because of delayed movement and avoidance of coughing and deep breathing; reduced patient satisfaction, and increased hospital costs (Shang & Gan, 2003). In a study done by Mei et al. (2009) to assess the incidence of post-operative pain in need of intervention (PPINI) and its effects on PACU LOS and subsequent hospital LOS, they found that patients in need of intervention had a significantly longer PACU stay (89.6 min [70-120] vs. 80 min [60-100], $p < 0.001$) and these same patients had a high median hospital stay (6.6 days [4.0-8.8] vs. 6.0 days [3.2-7.8], $p < 0.001$). These physiologic consequences can lead to long term psychological effects.

Considering that pain has an emotional component, there are psychological affects that occur as a result of prolonged pain that cannot go without mention. McMain (2010) contends that due to the insidious nature of the psychological changes that occur with persistent pain, these changes are not generally obvious to the PACU nurse while the patient is in their care. However, McMain (2010) explains that "some patterns of cognition, emotion

and behavior are: fear avoidance behavior, worry and catastrophising, anxiety, anger, sleep deprivation, low mood, and depression” (p. 62). The significance of this is that, post PACU care, there is a potential for the patient to continue with these types of responses which may lay the ground work for long-term behavioral changes (McMain 2010). Therefore, it is important for effective pain management to proceed upon the patients’ emergence from anesthesia. At this juncture it is necessary to look at the pharmacologic and non-pharmacologic methods for treating acute pain.

Pharmacologic and non-pharmacologic pain management

Pharmacologic

The pharmacologic modalities can be divided into local, regional, oral and systemic, however this discussion will focus on systemic pharmacologic modalities that are primarily used in the PACU setting (Shang & Gan, 2003). The systemic pharmacologic modalities are both opioid and non-opioid in nature. As previously mentioned, the opioid medications used with the greatest frequency at this organization, are Fentanyl and Dilaudid.

Pharmacologically, Fentanyl resembles morphine, but it is less potent and has a shorter analgesic duration and lesser side effects than morphine (Dipiro et al., 2008). Therefore, it has to be given more frequently to achieve the desired effect. Parenteral doses of Fentanyl are usually 25-50 micrograms for moderate to severe acute pain (Dipiro et al., 2008). Immediate post-operative pain is usually moderate to severe (Summers, 2001). Fentanyl has many of the same side effects as most opioids such as sedation, nausea/vomiting, and constipation however, it is unique in that in high doses it causes lung rigidity which makes it difficult for the patient to breathe (Dipiro et al., 2008).

Alternatively, Dilaudid is more similar in characteristics to morphine than Fentanyl; however it is more potent than morphine with fewer side effects (Dipiro et al., 2008). Dilaudid has a slightly longer onset of action, 10 minutes as compared to 7 minutes with Fentanyl, but its duration of action is longer (Dipiro et al., 2008). Consequently, using Fentanyl for its quick onset of action proves useful for the patient upon arrival to the PACU to calm the initial pain a patient experiences upon emergence of anesthesia. Thereafter it is more appropriate to use Dilaudid which is more potent and has a longer duration of action, particularly for an inpatient population, as they can still be closely monitored. It is better to get a steady state of the medication in the bloodstream for better pain control without the peaks and valleys that occur with Fentanyl. The reader should bear in mind that this course of treatment is not desirable for the outpatient population due to the inability to further monitor the patient for sedative side effects in the home setting. Fentanyl is the drug of choice for outpatients because of its short half life. However the focus for this project will be on the inpatient population.

Non-pharmacologic

Before moving forward it is important to note that poorly managed pain occurs as a result of inadequate pain assessment and analgesic treatment modalities as opposed to nonuse of non-pharmacologic pain management interventions (Titler & Rakel, 2001). Non-pharmacologic modalities include cognitive and behavioral interventions such as distraction and relaxation; topical interventions such as application of heat and cold, vibration, and superficial massage (Shang & Gan, 2003; Titler & Rakel, 2001). All of these modalities can be used in the immediate postoperative phase to help augment pharmacological interventions.

It is unknown why, with the abundant information that shows the consequences of unmanaged pain and the various treatment modalities available, why effective pain management remains so elusive. The knowledge and attitude of nurses has been implicated in many studies as the main hindrance for effective pain management postoperatively (Brown, 2008; Chung & Lui, 2003; McCaffery & Ferrell, 1999; McMMain 2010).

ASPAN Pain and Comfort Guidelines

As previously mentioned, ASPAN is the governing body that make recommendations for practice for perianesthesia nurses. Use of guidelines from this organization is expected to give credence to incorporating these particular guidelines in the pain management plan in the PACU of the project organization. The ASPAN Pain and Comfort Guidelines (see Appendix 1) were developed to fill the gap for perioperative nursing pain management practices by providing educational support and providing a template to evaluate and intervene to decrease the pain for patients' within the perioperative continuum (Krenzischek & Wilson, 2003). The guidelines were developed in phases by an appointed team from ASPAN called the Pain and Comfort Consensus Strategic Work Team (SWT) (Krenzischek & Wilson, 2003). The guidelines address pain and comfort elements that can be used preoperatively and in phase 1 and 2 of postoperative care. Post operative Phase one recovery occurs in the immediate postoperative period where the patient is monitored closely and assessed frequently to note when they have met certain criteria before they can be progressed to phase two. These criteria at the project organization involve the patient reaching their preoperative Glasgow Coma Scale, vital signs and mobility. The criteria also involve the patient meeting a score of 11 or greater on the Aldrete scale that has a max score of 14. Lastly, the patients' pain level

must be below five on a 0-10 Numeric pain scale before they can be progressed to phase two or be transferred to a nursing unit. In Phase 2 the patient continues to meet the criteria in phase 1 and they are able to tolerate being out of bed to a chair with minimal nausea and vomiting. During the last phase of testing guidelines were shown to have clarity, usability, and feasibility in a variety of perianesthesia settings (Krenzischek & Wilson, 2003).

One unavoidable limitation of, not only the ASPAN guidelines, but of pain management in general, is the complexity of managing patients with neuropathic pain. Creators of the ASPAN guidelines suggest additional education is needed for nurses to understand the intricacies of neuropathic pain and the need for a multimodal approach to its management (Krenzischek et al., 2004). These authors indicate the unfamiliarity of nurses using a combined opiate and non-opiates in addition to anticonvulsants and antidepressants to treat neuropathic pain (Krenzischek et al., 2004). Therefore, it will be necessary to add a neuropathic pain management component when conducting the education of the guidelines for the nurses in the PACU. The guidelines, notwithstanding, are but one component of this process of implementation, the greater question is readiness of the organization to support the guidelines and the process of implementation. To determine the organization's readiness an organizational assessment must be completed.

Organizational assessment

There are two major elements to consider when making an organizational assessment, and they are organizational structures and organizational process. Additionally, it is important to show how this project is a priority for the organization by conducting a cost-

effectiveness analysis. These discussions will highlight the organization's readiness and subsequent benefit of implementing the ASPAN guidelines.

Organizational structure

There are several key assessments of an organization to be made when trying to determine its readiness for change. One key assessment of the organization includes examining its organizational structures, which include the practitioner's knowledge and attitude, systems to get patients what they need, and pain management standards. More specifically, organizational structures refer to the setting and the processes to conduct care (Rietman, 2001). Per Rietman (2001) "structures are readily identifiable tangible aspects of the organization such as the grouping and expertise of people; the allocation of responsibilities and resources, the availability of equipment; and written policies, procedures or protocols" (p. 297).

Another important aspect is the practitioner's knowledge and attitudes as previously mentioned. Rietman (2001) discusses the importance of acknowledging how it has been shown that the nurses' education and experience with pain management directly impacts their ability to manage pain effectively. Also, Rietman (2001) points out that because one's practice is shaped by their attitudes and beliefs, the importance they give to pain management, good or bad, will translate into their pain management practices.

Equally, it is important to have the systems in place to get patients what they need. Rietman (2001) stresses that it is essential to examine organizational systems designed to get the appropriate medications or therapies to patients who need them in a timely fashion. This organization is the only hospital in the area to employ Critical Care Nurse Practitioners (NP)

in their PACU. These NP's are employed by the department of anesthesia and have received specialized training in pain management. The project organization's satisfaction scores indicate that patients who report having to wait to receive their medications report significantly higher pain intensity (Rietman, 2001). Thus, with a Nurse Practitioners readily available on the unit, the response in obtaining orders for pain medication is drastically reduced from previous protocols that required the staff nurse to wait for the anesthesiologist to arrive to obtain orders for pain or the lengthier process of paging the anesthesiologist, waiting for the return call, obtaining the order, retrieving and administering the medication. Also, standardizing prescribing practices and systems for dispensing and administering medication potentially can influence pain management outcomes for patients (Rietman, 2001). Currently, at this organization the PACU uses a pre-printed Anesthesia pain management order set. Reitman (2001) noted that the use of pain management standard involves the use of evidence-based practice guidelines, clinical pathways, patient care plans, and documentation systems which have been reported to positively influence pain management outcomes. None of these systems existed prior to the implementation of these guidelines.

Organizational Process

The organizational processes are seldom written and usually stem from the ways providers work together informally. The manners in which professionals communicate with one another regarding patients' pain management and the level of professional autonomy for decision making within one's scope of practice are examples of organizational process that may affect clinical outcomes (Rietman 2001). One such example is the change of shift report.

It is one of the primary mechanisms for nurse-to-nurse communication, with the targeted function of the report being to convey pertinent information regarding individual patients, thereby allowing the incoming nurse to develop and execute a plan of care for his or her shift (Rietman 2001). Typically at the project organization, the pain management plan is not discussed in depth outside of the hand-off nurse identifying what medications have already been given to the patient. By incorporating pain-related care in the shift change report, it will help keep the patient's pain visible.

Another organizational process deals with collaboration. It involves how nurses, physicians, and other healthcare providers work together to jointly plan pain-relieving care can affect patient outcomes. It also offers opportunities for nurses and physicians to discuss patients' analgesic needs which often are limited or guarded (Rietman, 2001). These concerns will be further addressed during the discussion of the models that will be used for the project implementation. At this point it will be helpful to discuss how the implementation of these guidelines will benefit the organization financially.

Cost-effectiveness analysis

To help determine the appropriateness of implementing the ASPAN Pain and Comfort Guidelines, it is necessary to complete a cost-effectiveness analysis. Already, research has shown that "inadequate post-operative pain management has been shown to have important economic consequences for health systems, including those associated with increased patient morbidity, extended stays, and unplanned readmissions" (Koo, 2007, p. 12). Nonetheless, the focus for this cost-effective analysis will be limited to pain management

efforts by nurses in the immediate post-operative PACU phase of the patients' inpatient admission to the hospital.

First, it necessary to identify the existing costs a patient currently incurs in the PACU in the absence of the pain management guidelines. A patient in the PACU is charged a bulk charge of \$473 for the first 30 minutes of care they receive in the PACU. This fee includes nursing care, room fee, and general supplies used on every patient (e.g. IV tubing, syringes, etc.). Thereafter the patient is charged \$227.00 for every half hour the patient stays in the PACU. Although, patients' are charged these fees, it is not guaranteed that the organization will receive the entire amount. This is due to the predetermined amount an insurance company will pay for a particular procedure. Subsequently, the same payment is received despite the patient's LOS in the PACU. One important immeasurable component that will not be factored into this analysis is the understanding that the majority of the United States population which has insurance receives it through their employer. Employers vary in the extent of coverage and the type of coverage their employees receive. Also, Medicare and Medicaid generally pay below the market value for any given procedure. Therefore, due to the complexity of making this determination, this analysis will focus on what it costs the organization to provide care, with the assumption that some surgeries pay more than others.

To determine cost effectiveness, it is more pertinent to analyze what it costs the organization to provide a service or care for the patient. On average each nurse in the PACU is paid \$40.00 per hour. There is a mixture of senior nurses, greater than ten years, and less senior nurses whose experience is less than ten years. The nurse patient ratio in the PACU is one nurse to two patients. Therefore, it costs the organization \$40.00/ hr for every two

patients or \$20 per hour per patient. Also, there are additional supply costs that may be incurred by the organization once the supplies in the bulk charge have been used. However, the majority of those supply costs is below \$10.00 and is thus considered negligible.

Additional components to consider in this cost-effectiveness analysis are the cost of the medications being given in the PACU setting. At this organization the most frequently used pain medications are Fentanyl 100mcg vial, Dilaudid 1mg tubex, and Ketorolac 30mg vial. The costs of these medications are as follows: Fentanyl 100mcg vial= \$0.48 ea., Dilaudid 1mg tubex=\$0.97 ea., and Ketorolac 30mg vial= \$0.48 ea. Generally, Fentanyl is the first line of treatment because it is fast acting but has a very short half life. The anesthesiologist at the project organization usually orders for 25-50mcg every 10 minutes as needed for pain with a repeat dose varying from 2-6 repeat doses. So a patient can receive 50-100mcg up to 150-300mcg before they can proceed to Dilaudid. The Dilaudid has a slower onset of action but is more potent and lasts longer. This medication, on average, is ordered from 0.5-1mg every 10 minutes as needed for pain with a 1mg minimum dose to 4mg maximum dose. The Ketorolac is not an opioid, but is a very potent non-steroidal anti-inflammatory that works better for muscle cramp type pain. This medication is ordered as a 30mg one time dose as its frequency is every six hours.

It is expected that with the implementation of the guidelines that there will be an increase in the use of Dilaudid and Ketorolac because of the immediacy and potency of these medications and a decrease in the use of Fentanyl. Currently, from reviewing patient records (N=800), Fentanyl is used at a rate of 250mcg per patient during their stay in the PACU. This amounts to \$1.20 per patient. Dilaudid is used at an average rate of 2mg per patient and these

amounts to \$1.94 per patient. Ketorolac is used too infrequently to give a per-patient account. It is expected that with the guidelines in place that Fentanyl will be decreased to at a rate of 100mcg per patient, Dilaudid increased to 4mg per patient, and Ketorolac at 30mg per patient (where applicable because of its risk of increase bleeding).

Since the organization will get paid the same amount for a particular procedure despite the patient's LOS in the PACU, the organization would need to provide the same care in less time and be able to do a higher volume of patients to yield more profit. During the last three months (Aug-Oct) the average length of stay has been 201min or 3hr 35min. The Washington, DC region hospitals were polled about their average LOS and it was recognized that all of the hospitals in the region reported an average LOS of 2 hours. To meet the regional average then it would be necessary to decrease the average LOS by 1hr 35min. Currently, at a LOS of 3hr 35 min. it costs the organization \$67 for 3.35hrs of nursing care. On average the organization does 40 surgeries per day. Therefore, at \$67 per patient for 3.35hrs of care, it costs the organization \$2680 per day. For 800 patients per month (excluding weekends) this translates to \$53,600 per month for 3.35hrs of care.

By implementing the ASPAN Pain and Comfort Guidelines it is expected that the average LOS would decrease by 1.35 hours to meet the regional average or lower. The anticipated cost reduction would be \$32,000 per month for 2hrs of care. This would result in a profit of \$21,600 per month, which would lead to \$259,200 per year. It is from this that cost to implement the guidelines would be subtracted.

The cost of implementing the guidelines entails factoring in a number of components, such as the cost of the person introducing and teaching about the guidelines; the cost per hour

for each nurse who spends time away from work to learn about the guidelines; and the cost for purchasing the quick reference guides. The cost for the instructor of the guidelines will be an in-kind cost because the instructor is equally the author of the project who is a salaried manager in the organization. Therefore, it is expected and thus part of her salary that she conduct performance improvement projects in her unit. There are 30 nurses in the PACU and an hour will be spent on instruction of the guidelines. This removes an hour of productivity on the unit. As previously noted, the average nurse's pay is \$40 per hour and thus with 30 nurses, it will cost \$1200 for training. The cost for the quick reference guides were \$50. There may be other miscellaneous costs that are currently unforeseen and an approximation of \$100 will be set aside for it. Additionally, with the expected increase use of Dilaudid to \$3.88 and Ketorolac to \$0.48 per patient for 800 patients per month, it results in a cost of \$3,104 and \$384, respectively, the subsequent grand total for implementing the guidelines will be \$4,818 for one month.

After the nurses are trained and reducing the miscellaneous costs to \$50 for the year (training new nurses and replacement of quick reference guides as needed), the grand total for the remaining 11 months of the year would be 43,236. This brings the net profit to the organization for one year to \$215,964. This profit is five times greater than what it costs the organization to implement this project, thus making it an economically sound decision to move forward with this project. Further gains may be seen in patient satisfaction scores and improved patient outcomes. Other costs not considered in this project which are pertinent but not relevant for the scope of this project are the costs associated with poorly treated pain such as longer hospital stays and readmissions related to pain. To get this project underway, it is

helpful to use a model or a framework to steer or organize the steps needed to see it to fruition. Two models will be used to help conceptualize the components of this project, but the models will be operationalized in more detail in the methods section.

Theoretical Models

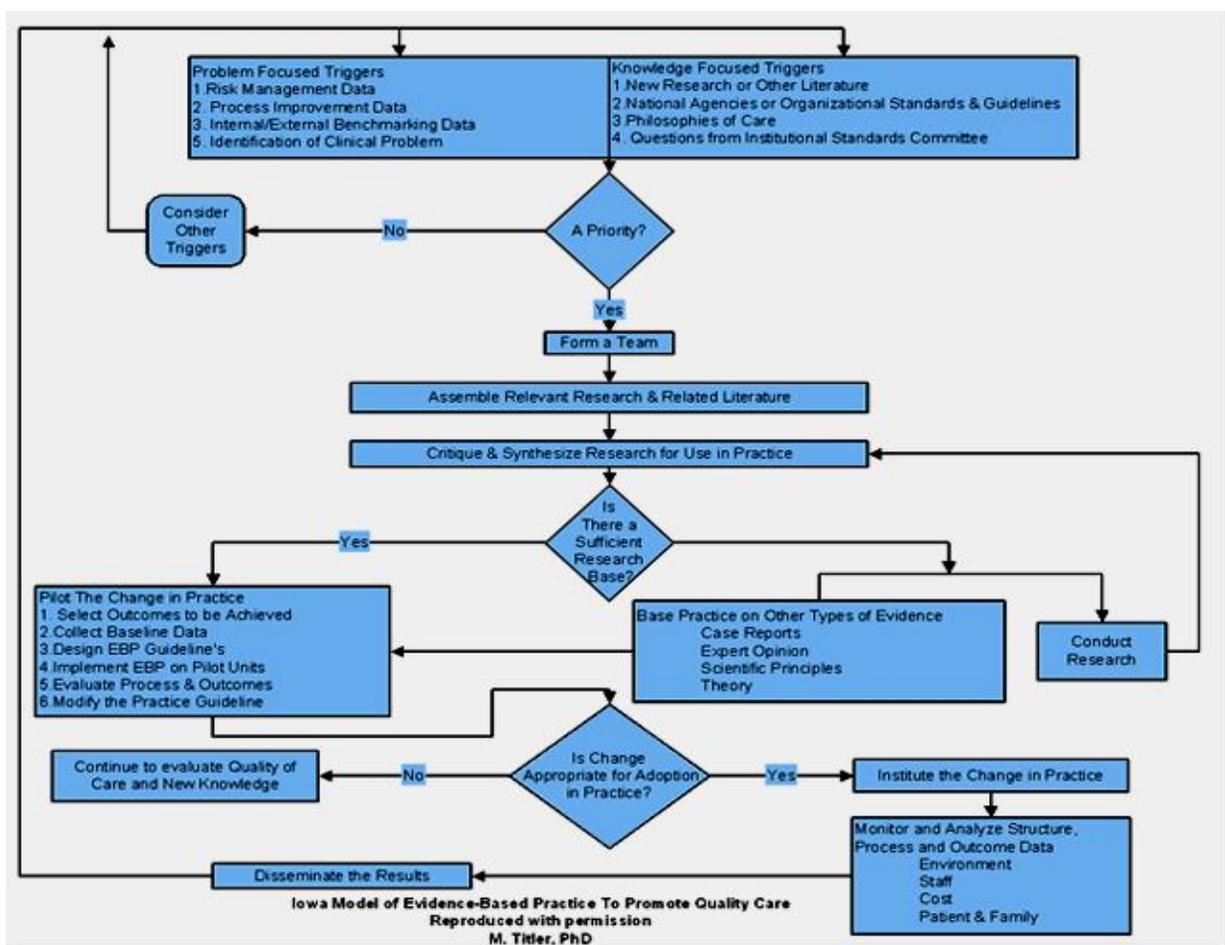
The Iowa model of Evidence-Based Practice to Promote Quality Care (Titler et al., 2001) was chosen to implement the ASPAN Pain and Comfort Clinical Guidelines in the PACU at the project organization (See Figure 1.). Use of the Iowa Model in a hospital setting has its advantages because it stresses the importance of taking into account the entire healthcare system which incorporates the providers, patients, necessary infrastructure and their influence on incorporating evidence findings into practice (Dontje, 2010). Going forward, there will be a brief discussion on how the Iowa model will be used to implement the ASPAN Pain and Comfort Clinical Guidelines in a PACU.

A key component in initiating the Iowa Model is to identify if your issue is triggered by a problem or knowledge deficit (Dontje, 2010). Currently, the pain management practice in this organization's PACU can be considered haphazard because there are no guidelines in place for the nurses to use to guide their practice, thus making this a knowledge focus problem. This knowledge deficit directly and indirectly affects the organization because effective pain management has been proven to affect patient satisfaction scores (Innis et al., 2004), thereby making this a priority for the organization. Equally important in determining the clinical relevance is gaining support of other stakeholders, such as in this case, the anesthesiologists, preoperative and postoperative nurses and the managers of all these

groups. Following acquiescence by the stakeholders, it is then necessary to search the literature and find sufficient evidence to facilitate change in practice.

The evidence has to be evaluated and graded to determine its usefulness and its strength for making practice changes. Lastly, one of the final steps of the Iowa Model suggests that the indicated change be instituted and an outcome evaluation should be completed (Dontje, 2010). Therefore, use of the Iowa Model and its systematic approach will be very advantageous in implementing the ASPAN pain & comfort guidelines since it accounts for the organization as a whole.

Figure 2.1 Iowa Model of Evidence-Based Practice to Promote Quality in Care



Equally important are the individual providers, in addition to an organizational perspective, therefore Rogers' Diffusion of Innovations (Rodgers, 2003) model has been chosen to better address the individual needs that are also necessary to implement the pain guidelines (See Figure 2.). The main premise of this Diffusion of Innovation model is to help examine characteristics of the innovation and how the message is delivered to its users within an organization (Titler, 2007). The Diffusion of Innovations framework is composed of the characteristics of the EBP; the communication process; the users of the EBP; the social system and how they interact with the users of the EBP; and lastly it deals with the rate and extent of adoption.

Characteristics of the EBP

Titler (2007) suggests a few tools that can be used to help the adoption process of a new innovation such as quick reference guides, decision aids, and clinical reminders. To aid the adoption of the ASPAN guidelines, quick reference guides will be purchased from ASPAN that will be distributed to each nurse on the unit. Another important feature of Rogers' model is the communication process. This process incorporates components of communication that involve interpersonal skills, methods of communication, and circles of influence among the users of the innovation (Titler, 2007). The circle of influence involves three types of roles that already exist within any given unit or work place and they are opinion leaders, change champions, and expert consultants (Titler, 2007). These persons help promote the integration of the innovation.

Communication Process

Opinion leaders are those persons whom their colleagues respect due to their knowledge base and are thus highly influential (Kleinpell & Gawlinski, 2005; Titler, 2007). More specifically, opinion leaders have some of the following characteristics: expected to evaluate and determine if the new and old practice can be intertwined; able to sway the opinions of others; acquire and utilize the innovation effectively (Kleinpell & Gawlinski, 2005). These are just a few of the main characteristics. The PACU, at this organization, is equipped with a small number of opinion leaders and they are so because of their 20 plus years of experience or high level of formal education. So they are able to help drive the adoption of the innovation in a positive direction.

Furthermore, change champions are needed because they, in addition to being expert clinicians, can be very fervent about the change in practice (Titler, 2007). Their effectiveness derives from the positive working relationships they have with their colleagues and their ability to take an active role in the education and orientation process of the users of the innovation (Titler, 2007). They also have a farther reach than the opinion leaders due to their initiatives in the educational process and commitment to quality care (Titler, 2007). There is a Master's prepared nurse who is a level four nurse on the unit and is already responsible for assisting with the educational needs of the unit. In addition there are two nurse practitioners on the unit who assist the anesthesiology department to provide care and coverage for the PACU. They too, assist with the educational needs of the unit. Lastly, there is a nurse educator assigned to the PACU and she focuses on perioperative care delivery. These persons will be utilized as change champions.

At the same time expert consultants or facilitators play a vital role in the assimilation of the innovation. This role is for the “topic expert” who is generally not a member of the organization but who is knowledgeable about the process and is able to serve as a resource to the users of the innovation (Rycroft-Malone et al., 2002; Titler, 2007). Their focus is on moving and steering the users from one point to the next in the process of implementing the innovation. As opposed to the opinion leaders or change champions, their role is focused on enabling the users of the innovation versus using persuasion tactics (Rycroft-Malone et al., 2002). The author of the project will assume this role. She is also the Co-Chair of the Pain Resource Nurse Committee and a member of the Hospital Pain Committee at the organization and thus has a notable amount of expertise in pain management.

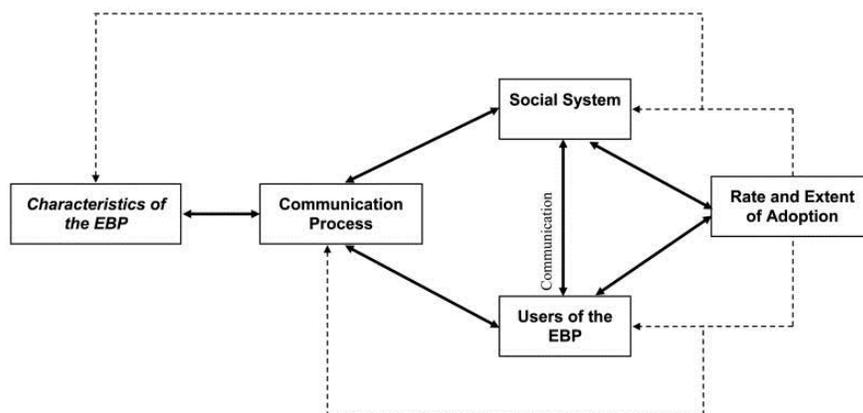
Users of the EBP

Adoption or assimilation of the innovation is largely affected by its users’, Titler (2007) asserts, because of their education, motivation, values and preferred learning style. Titler (2007) proposes using mechanisms such as gap assessments of performance, audit and feedback, and mini pilots of the innovation to encourage and support the innovation’s implementation. Alternatively, the author will focus on the audit and feedback mechanism in conjunction with practical learning sessions to enhance the acquisition of the pain guidelines. This type of multimodal approach has been shown to be one of the most effective educational approaches to learning new innovations (Dulko, 2007; Marchionni & Ritchie, 2008; Prior et al. 2008; Rycroft-Malone et al., 2002).

Social System

The social system has many components but it essentially involves the readiness of the organization to support change and its communication and show of support to the users of the innovation (Titler, 2007). This organization has demonstrated its readiness through its strong focus on EBP throughout the system as evidenced by incorporating EBP in all of their policies and standards of practice. Support for EBP has also been shown through the enhancement of their various project improvement committees through the incorporation of an educator and librarian for every committee. At the same time, with the current financial climate, the organization welcomes methods to increase revenue. Lastly, the Diffusion of Innovations model examines the rate and extent of adoption. However, to look at this component of the framework is beyond the scope of this project.

Figure 2.2 Rogers' Diffusion of Innovation Theory



Outcomes to be measured

In order to fully derive the outcomes to be measured, it is necessary to conduct outcomes research that will give a framework for determining the most appropriate outcomes. The authors Melnyk and Fineout-Overholt (2005) discuss the six elements of intervention per the work from Sidani and Braden (1998) that are involved in outcomes research. The first essential element is to identify the problem in need of intervention, which for this project it is the need to employ evidence to guide practice that will provide structure to method of managing pain in the PACU setting (Melnyk & Fineout-Overholt, 2005).

The second step “consists of the critical inputs that clarify the specifics of the intervention, how the intervention will be delivered, and the strength of the intervention required to produce an effect” (Melnyk & Fineout-Overholt, 2005, p 307). Therefore it will be pertinent for the nurses to understand that the ASPAN Pain and Comfort Guidelines is an interdisciplinary guideline that requires the patient involvement. Thus, all prescribers need to be aware of the guidelines. The delivery methods will be discussed shortly, in the methods section.

Next, the third element is the mediating processes, which “identifies the expected activities that ultimately produce the desired outcome” (Melnyk & Fineout-Overholt, 2005, p 308). This is where the audit and feedback mechanism becomes important to assist with knowledge acquisition. In addition to the audit and feedback process, it is helpful to note if the expected changes are occurring, which happens to be the fourth step. Hence, it is key to examine if there is a decrease in the pain level of the patients and length of stay as a result of using the guidelines.

The fifth and sixth steps involve unrelated interfering factors and implementation issues, respectively (Melnyk & Fineout-Overholt, 2005). Examples of unrelated interfering factors include, but are not limited to, nurses resistant to change, turnover time and throughput issues in the recovery room setting and varying acuity. On the other hand, implementation issues involve such things as provider readiness for change, and organizational properties that will support the change process. These were addressed during the review of the organizational structure.

To further assist with the management of outcomes, the outcomes management model chosen is the Three-Dimensional, Multidisciplinary Model. This model per Melnyk & Fineout-Overholt (2005) is able to characterize for the organization outcomes management and its surrounding activities irrespective of the patient population. This three dimensional model uses “incorporated outcomes measurement, analysis of healthcare practices, and development and implementation of care delivery processes based on evidence and it includes institutional values as the driving force behind all measurements, analyses, process improvement, and reevaluation activities “(Melnyk & Fineout-Overholt, 2005, p. 313). Thus some of the needed resources will be allocated hours for staff education, team facilitation and participation, establishment of databases, and collection and reporting of data. These are only a few of the resources needed, that were equally mentioned in the cost-effectiveness analysis. To follow will be the method in which this project will be conducted.

Chapter 3

Methods

Design

The design of this project will be a two-group pre- and post-intervention implementation outcome study. In so doing, it will be possible to visualize the effects of the guidelines on the existing pain management practice. Currently, each nurse indicates the reason for the length of stay that is over two hours chosen from potential reasons that are listed on the back of a charge sheet that is used for every patient. Once the patient has been transferred to the ward the charge sheet is given to the unit clerk, who then inputs the reason into a database called Operating Room Manager (OR Manager). The OR Manager software system automates each step of the perioperative documentation process, to include information such as surgical scheduling, perioperative documentation, supply chain management, tissue tracking, and billing (<http://www.picis.com/solutions/perioperative-services/or-manager.aspx>, 2010). The OR Manager system can be queried to obtain LOS reason data.

Sample

There is cohort of 30 nurses in the Main PACU whose experience ranges from 2 years to 30 years with a mean nursing experience of 10 years. Baccalaureate nurses comprise 1.5% (N=5) of the cohort; there is one nurse with a Master's degree in Nursing; and the remaining, with the exception of one diploma nurse, are all Associate degree graduates.

When looking at PACU nursing experience, of the 30 nurses, only two nurses have less than two years of PACU nursing experience. The remaining nurses range from two years to 30 years of PACU nursing experience with the majority falling between the 2-7 years range of experience with the exception of one with 30 years of experience. Only one nurse is a Certified Post Anesthesia Nurse (CPAN). All of the nurses for the project unit are included. There are no exclusion criteria for the nurses. The demographic characteristics vary widely only in the category of age as can be seen in Table 1.

Table 3.1: Project nurses population demographics

Demographic	Percentage	N (total=30)
Age		
• 20-25 yrs	1%	1
• 26-30 yrs	3%	2
• 31-35 yrs	5%	3
• 36-40 yrs	44%	12
• 41-45 yrs	43%	9
• 46-60 yrs	4%	3
Gender		
• Male	7%	2
• Female	93%	28
Race		
• African-American/Black	97%	23
• Asian	2%	2
• Caucasian	1%	5

This year the nurses in the PACU have been required to complete a mandatory computer module on general pain management concepts that was non-specific to PACU. Prior to this the nurses had received no additional formal training on pain management with the exception of a Pain Self Learning Packet they received during their orientation to the PACU. Concurrently, the Anesthesia department instituted a pain block program where the

nurses received some additional training on how to assist the anesthesiologist when performing a block. Occasionally, there are random in-services on pain management given by various anesthesiologists, but it is not done with any consistency.

Setting

The organization is a 907 bed level one trauma hospital located in an inner city environment. However, the patient population varies widely due to the various specialty services, such as cardiac, oncology, etc. Nonetheless, the majority of the patient population has many of the co-morbidities generally seen in an inner-city environment (e.g. hypertension, diabetes, hyperlipidemia, and peripheral vascular disease). The PACU, where the project will take place, is a seventeen bay, newly built unit. Approximately 40 patients a day are recovered there and this equates to approximately 800 patients per month, excluding the patient volume on the weekends. There are two critical care nurse practitioners and an anesthesiologist that provide immediate coverage to the needs of the patients while they are in the PACU. These providers are able to write additional pain orders based on both the recommendation of the PACU nurse as well as their own assessments.

Intervention

The ASPAN Pain and Comfort Guidelines were developed to fill the gap for perioperative nursing pain management practices by providing guidance and educational support for nurses to better manage pain of patients' throughout the different perioperative phases (Krenzischek, D. et al. 2004). As mentioned previously, the guidelines were developed in phases by an appointed team from ASPAN named the Pain and Comfort Consensus Strategic Work Team (SWT) (Krenzischek, D. et al. 2004). Again, the guidelines

address pain and comfort aspects that can be used preoperatively and during phases 1 and 2 of postoperative care. The nursing educational session given by the author will focus mainly on the areas of the guidelines that pertain to the postoperative phase 1. The nursing educational session given by the author will focus mainly on the areas of the guidelines that pertain to the postoperative phase 1. The session will first define pain; give some background on how the lack of pain management affects the LOS; followed by details of the key components of the guidelines, assessment, intervention and expected outcomes. (See Appendix A for guideline details and Appendix B for pain in-service).

Procedure

- The Iowa Model (Titler, et al. 2001) in conjunction with the Diffusion of Innovations model (Rogers, 1995) will be used as a framework to operationalize and address the various components of guideline implementation.
- Per the Iowa Model's first step, determining if the trigger for an issue or gap is a knowledge focused trigger or a problem focused trigger has been determined for this project with the realization that it is a gap in pain management knowledge.
- Reducing increased PACU LOS has been identified as a priority for the institution to reduce it through the cost effective analysis that was performed.
- A team will be formed that consists of opinion leaders, change champions and acute care nurse practitioners to act as on-going facilitators. The next step is to initiate the Diffusion of Innovation model.
- The Diffusion of Innovation model first looks at the characteristics of the innovation (ASPAN guidelines). Here, practice prompts, such as the ASPAN

quick reference guide, will be utilized as a trigger for the nurses to use the guidelines (see Appendix C for quick reference guide). A researcher developed questionnaire will be used to collect patient information about the age, gender, and race, type of surgery and total length of time in the PACU (See Appendix D patient data collection tool). No identifying patient information will be collected as it is not pertinent to the desired outcome data. Reasons for increased LOS and type of surgery data are already collected through the OR manager system. Thus this study will not alter the daily routine.

- An hour long interactive educational workshop over a 3 week period on the post-operative components of the guidelines will be provided in a designated classroom. Workshops will be conducted on different shifts and off-shifts to assist in obtaining all 30 nurses or at least 80% (n=24) compliance with attendance.
- To address the communication process, opinion leaders and change champions will be used to engage and influence the behaviors of the nurses in the PACU.
- The social system will be addressed by educating senior leaders through a one-time interactive workshop where they will be briefed on the financial benefit of implementing the guidelines. Additionally, an orientation packet for use with new staff.
- Once the education aspect of the guidelines is complete, then the knowledge gained by the nurses will be supported through an audit and feedback mechanism. A team of the investigator along with the change champions will conduct daily audits on each employee by observing them at the bedside for one week and

provide immediate feedback as to the proper use of the guidelines. The feedback will be in the form of positive reinforcements and reminders on applicable components of the guidelines that are relevant to the care they are providing at the time of the audit. After the one week of daily auditing, the team will then conduct random audits for the remaining three weeks to include three additional audits on each employee. (See Appendix E for nurse audit tool).

- At this point, referring back to the Iowa model, it will be necessary to pilot the intervention in the Main PACU for one month.
- Finally the data will be queried from the OR Manager data management system for a period of one month to compare the pre and post intervention LOS data related to pain.

Outcomes

There are a number of expected outcomes from implementing this project. First, to note the number of nurses who are in attendance, each nurse will have to sign next to their name on a preprinted roster sheet. It is expected that usage of the guidelines will occur in at least 60% of the patient population during the project month. The nurses will use a data collection tool to obtain data on each patient that reflects their use of NSAIDs, adjuvants, non-pharmacologic measures, patient/family education, and change in balance of medications and pain scores, which will be entered into a spread sheet. To clarify, the change in balance of medications refers to the expected increase in the use of Dilaudid, which is more potent and longer acting, and Ketorolac, which augments pain management by acting on additional pain receptors, with a subsequent decrease in the use

of Fentanyl which is potent, but very short acting. Secondly, with more focused and effective pain management, it is expected that this will result in a decrease LOS related to pain. A comparison in the pre and post implementation data will uncover any differences. Lastly, the current financial impact for 800 patients per month (excluding weekends) is \$53,600 per month for 3.35hrs of care. With a reduction in the LOS, the potential savings after the guidelines are implemented would be \$32,000 per month for 2hrs of care. This would result in a profit of \$21,600 per month, or annual revenue of \$259,200 per year. This calculation takes into account nursing costs, PACU hospital charges and the cost of the used medications. Although these are the expected outcomes, there may be additional benefits or detriments that are unforeseen. Once the project has been implemented the expected and unexpected outcomes will be realized.

Data Analysis Plan

Descriptive statistics will be used to analyze the data including: the average LOS for pain, post guideline implementation; the frequency of the nurses' use of ASPAN guidelines; the use of Fentanyl, Dilaudid, and Ketorolac; and the average pain level upon discharge from the PACU. These characteristics will be divided into pre and post guideline implementation categories. The data will be analyzed using T-test, Wilcoxon rank-sum test and chi-square test to compare the mean, distribution and percentage between the two groups respectively. Two-tailed p value <0.05 will be considered to be statistically significant.

Chapter 4

The overall goal of this project improvement was to decrease PACU length of stay (LOS), related to pain, by improving the pain management performance of nurses in the PACU through the implementation of the ASPAN Pain and comfort Guidelines. More specifically there were three aims of this project:

Aim 1: Evaluate the impact of implementing the American Society of PeriAnesthesia Nursing (ASPAN) Pain and Comfort Guidelines in a PACU on:

A. number of PACU nurses who were educated about the ASPAN guidelines (total nurses, n=30 or 80% n=24))

B. PACU nurses use of the ASPAN guidelines in 60% (N=210) of the PACU patient population as demonstrated by:

1. Increase use of evidence-based pain practices (NSAID, adjuvant, nonpharmacologic, patient and family education)
2. Change in the balance of medications used (decrease in Fentanyl use and an increase in Dilaudid and Ketorolac use)
3. The effects of the nurses' pain management practices as reflected in patient pain scores pre versus post implementation of the ASPAN guidelines using a 0-10 numeric scale.

Aim 2: Compare the differences in patient length LOS stay in the PACU pre and post implementation of the ASPAN pain and comfort guidelines.

Aim 3: Determine the cost-effectiveness of implementing the ASPAN pain and comfort guidelines in the PACU as reflected by:

- A. Extended LOS due to pain as a reason
- B. Use of medication (Fentanyl and Dilaudid)

To examine the achievement of these aims education, direct observation and audit-feedback were utilized for the first aim. For the second aim a retrospective chart review was conducted to collect baseline data and a prospective chart review was the data collection method for the test data. Lastly, a cost effectiveness analysis was used for the third aim. Statistical analyses were performed using SAS statistical software, version 9.

Demographic Findings

In the patient population, the results demonstrated that the demographic characteristics of the patient population pre implementation in the month of January and the post implementation during the month of March were similar in the inpatient population. The pre-implementation group contained 538 patients and the post-implementation group contained 350 patients. The demographic characteristics of the patients' pre- and post-implementation for age, race, and gender were not significantly different as outlined in Table 1. The types of surgical services also were not significantly different between the two groups.

Table 4.1 Characteristics of study population

	Pre ASPAN (N=538)	Post ASPAN (N=350)
Age	54.5±17.5	53.3±17.5
Female	292(54.28%)	180(51.14%)
Male	246(45.72%)	172(48.86%)
Race		
White	141(27.12%)	88(25.81%)
Black	334(64.23%)	224(65.69%)
Others	45(8.65%)	29(8.50%)
Service		
GEN	156(29.00%)	112(33.23%)
NEURO/ORTHO	141(26.21%)	80(23.74%)
ENT/ORAL SURG	35(6.51%)	25(7.42%)
VAS/THOR	75(13.94%)	48(14.24%)
PLAS	47(8.74%)	23(6.82%)
URO	18(3.35%)	17(5.04%)
OTHER	66(12.27%)	32(9.50%)

Data are means ± STD, or N (%).

Aim 1: Guideline implementation

There were 28 out of 30 (93%) nurses in the PACU who attended the one hour education session on the ASPAN Pain and Comfort Guidelines. The remaining two nurses were on leave of absence for the duration of the implementation period. At the end of the education session each nurse was given a quick reference guide for the guidelines for use at the bedside (see Appendix C). All 28 nurses were observed and audited twice by the team with an audit tool was utilized to note their performance and each nurse was given real-time feedback on their use of the guidelines. Daily huddles were done during the implementation period where key highlights of the guidelines were discussed and nurses were given an opportunity to discuss any challenges with the use of the guidelines or other factors affecting pain management in the PACU. For organizational support the guidelines were also

introduced to medical director of the PACU, senior nursing director, director, nurse educator, and the two nurse practitioners of the PACU. (It is important to note that there were a number of measured categories that were missing data, therefore the calculations were made from the data that was present. See Appendix F for table of percent missing data. The most notable was the LOS due to pain and this is likely because the not all of the LOS attributed to pain had a LOS in excess of 30mins greater than 2 hours.)

As part of the implementation process it was anticipated that the nurses would demonstrate use of the guidelines in 60% (N=210) of the post-implementation patient population which was measured by the use of non-opiate medications, adjuvants, non-pharmacologic measures, and patient/family education as pain management modalities. The data in Table 2 demonstrates that there were no significant difference in the use of non-opiate medications (χ^2 (p = 0.79)) or in the use of adjuvants (p=0.33). However, differences in the use of non-pharmacologic measures and the use of patient/family education were significant (χ^2 (p=<0.0001 for both analyses)) and respectively demonstrate a pre to post increase from approximately 2% to 50% for non-pharmacologic measures and 40% to 83% for patient/family education of the PACU patient population.

Table 4.2 ASPAN EBP practices used in care of inpatients

	Pre ASPAN (N=538)	Post ASPAN (N=350)	P
Acet/NSAID/Celebrex received	36(6.72%)	24(7.19%)	0.79
Adjuvant received	21(3.90%)	9(2.67%)	0.33
Non-pharm	12(2.23%)	168(49.56%)	<0.0001**
Pt./Fam education	216(40.22%)	283(82.99%)	<0.0001**

Data are n(%).

The use of Fentanyl, Dilaudid, and non-opioid medications were examined, as seen in Table 3. The use of Fentanyl significantly increased from 57% to 64% pre to post guideline implementation (χ^2 (p=0.0268)). However the reverse was expected. There were no differences in the use of Dilaudid or non-opioid medications pre and post implementation.

Table 4.3 Comparison of balance of Medications used pre and post implementation

	Pre ASPAN (N=538)	Post ASPAN (N=350)	P
Acet/NSAID/Celebrex received	36(6.72%)	24(7.19%)	0.79
Fentanyl use	306(56.88%)	214(64.46%)	0.03
Dilaudid use	195(36.31%)	132(39.52%)	0.34

Data are n(%).

The effects of the nurses' pain management practices pre and post guideline implementation were analyzed as measured by calculating the difference between the patient's admission and discharge pain ratings. The data were not normally distributed because the data set was skewed, thus the median and quartiles were calculated rather than the mean which is summarized in Table 4. The pain on admission data revealed by the third quartile that there was a statistically significant change (Wilcoxon rank-sum test (p = 0.02)). The pain on admission was also noted to be higher post implementation which may be attributed to the extra diligence of the nurses to properly assess pain. More importantly, the data showed that there was a statistically significant decrease in the pain at discharge from the PACU (Wilcoxon rank-sum test (p = 0.005)). The pain relief results, which were calculated by subtracting the pain on admission (POA) from the pain at discharge, were statistically significant in both the 1st and 3rd quartile, demonstrating that patients experienced more pain relief at discharge after the guidelines were implemented. Overall there was a

statistically significant increase in pain relief from 29.30% pre guideline implementation to 40.86% post guideline implementation (Wilcoxon rank-sum test ($p=0.001$)).

Table 4.4 The difference in the patient pain score

	Pre ASPAN (N=538)	Post ASPAN (N=350)	P
POA (pain on admission)	0(0, 5)	0(0,6)	0.02*
Pain at Discharge	2(0,4)	2(0,3)	0.005
Pain relief (Pain at Discharge - POA)	0(-2, 2)	0(-4,0)	<0.001
Pain relieved*	150(29.30%)	105(40.86%)	0.001

Data are median(1st quartile, 3rd quartile), or N (%).

* Yes if pain at Discharge – POA <0; otherwise, no.

Aim 2: Length of stay comparison pre vs. post

Decreasing LOS to less than two hours when LOS was due to pain was the goal of aim number two. The results in Table 5 capture the frequency in which pain was indicated as the LOS reason and other causes for an increase LOS (bed availability, physician request, respiratory instability, sedation, hemodynamic instability and other). There were 29 patients in the pre implementation group and 40 patients in the post implementation group where indicated as having extended length of stay due to pain. The frequency of extended LOS attributed to pain happened to increase from 13.24% (N=29) to 20.20% (N=40) after guideline implementation but was not significant ($p = 0.056$). A closer look at duration of time in the PACU (time patient recovered (TPR) – time into PACU), pain as the LOS reason depicts in Table 6, that after the guideline implementation, there was a statistically significant ($p= <0.0001$) decrease in duration of PACU LOS related to pain from a median of 2.95 hours pre implementation to 1.70 hours post implementation. Because the data were not normally distributed, the median and quartiles were used to calculate significance. The data also demonstrate that the goal, decreasing LOS to the local standard of 2 hours, was achieved

given that in the third quartile the LOS was at 4.02 hours pre-implementation and decreased to 2.17 hours post-implementation. The data from the first quartile at pre-implementation reveal that 25% of the patients were being discharged in almost three hours, while at post implementation 25% of the patients were being discharged in just over one hour. Lastly, the extended LOS (>2 hours) caused by pain was significantly decreased in the post-implementation group 9 (34.6%) compared to the pre-implementation group (26 (89.7%; $p < 0.001$)) which reflects a 55% decrease post guideline implementation.

Table 4.5 General Reasons for LOS (frequency)

	Pre ASPAN N (%)	Post ASPAN N (%)	Total N (%)
Not due to pain	190(86.76%)	158(79.80%)	348(83.45%)
Due to pain	29(13.24%)	40(20.20%)	69(16.55%)
Total	219(52.52%)	198(47.48%)	417(100%)
Frequency Missing = 475; p value=0.056			

Table 4.6 Extended LOS duration before/after for only LOS reason pain

	Pre ASPAN (N=29)	Post ASPAN (N=26)	P
LOS (difference in TPR and time in PACU), hrs	2.95 (2.50, 4.02)	1.70(1.25, 2.17)	<0.0001

Data are median (1st quartile, 3rd quartile).

Table 4.7 Extended LOS greater than 2 hours for only LOS reason due to pain

	Pre ASPAN (N=29)	Post ASPAN (N=26)	P*
LOS >2 hrs	26(89.7%)	9(34.6%)	<0.0001

Data are N (%)

Aim 3: Cost effectiveness

The cost effectiveness of the guideline implementation during the implementation month using indicators for extended LOS related to pain and medication usage was examined (See Tables 8 and 9). The results revealed for the patients who had an extended LOS pre-implementation (> 2 hours; N=26) times the cost of nursing care (average RN pay/hour= \$40

and RN:patient =1:2, therefore RN care cost/patient=\$20/patient) was \$520 pre-implementation. Post implementation there were twelve patients with extended stays related to pain and times the cost of nursing care, (\$20/patient), it yielded a cost of \$240. Although the increase in Fentanyl use was statistically significant overall, there was less Fentanyl used post implementation for those patients indicated as having an increased LOS related to pain. Out of the 26 pre-implementation patients a total amount of 2200 mcg of Fentanyl was used. Each tubex of Fentanyl contains 100 mcg's, therefore a total of 22 tubexes were used. As previously mentioned, Fentanyl costs \$0.48/tubex and this amounts to \$10.56. Conversely, in the post-implementation group, the total amount of Fentanyl used for the 12 patients was 1100 mcg's, which amounts to \$5.28. For Dilaudid the pre-implementation group used a total of 37mg's or 19 2mg tubexes. Again, Dilaudid costs \$0.97/tubex. Therefore, with 19 tubexes, the cost totals \$18.00. The post-implementation group used 34mg or 17 2mg tubexes. This amounts to \$16.49. Also, Ketorolac at a cost of \$0.48 was used at a rate of 3 vials pre-implementation and 10 vials post-implementation leading to a total cost of \$1.44 and \$4.80 respectively.

The total extended LOS (>2hrs) was calculated for each group in minutes because after the bulk rate, the patient is charged for every 30minute increment. There were 111.8 thirty minute increments for the pre-implementation group and 46 thirty minute increments for the post-implementation group. With a \$227 charge for every 30 minute increment the pre-implementation group accrued \$25,378.60 for all the time greater than 2 hours. On the other hand, the post-implementation group accrued only \$10,442 for the total time that was greater than 2 hours. This results in a net savings for the one month project period of \$14,

729.03. Projected over a one year period, the potential savings could amount to \$176,640.36.

Notwithstanding this cost savings, the true cost savings comes after factoring in the cost of the guideline implementation. Previously, it was roughly estimated that the cost of implementing the guidelines would be \$4,818 for the project month. This figure includes the cost of the nurse's time away from productive work, cost of medications, training materials and miscellaneous costs. With this amount factored in the total savings in the project month was \$9911.03.

Table 4.8 Hospital charges/costs

Item	Bulk Charge (1 st 30 min)	Every 30min charge	Fentanyl	Dilaudid	Ketorolac	RN Care
Cost	473.00	227.00	0.48 ea	0.97 ea	0.48 ea	20.00 per pt/day

Data in dollars (\$)

Table 4.9 Implementation Costs with annual projections

	A	B	C	D	E	F	G	H	
	Total # min >2hrs/30min for one month	Every 30min charge (\$)	AxB (\$)	RN Care \$20 x (N)	Fentanyl use (100mcg/tubex) x \$0.48	Dilaudid use (2mg/tubex) x \$0.97	Ketorolac use (30mg/vial) x \$0.48	C+D+E+F +G	(C+D+E+F +G) x 12 mo.
Pre (N=26)	111.8 min	227	\$25,378.60	\$520	(22) x .48= \$10.56	(19)x .97= \$18	(3) x .48=\$1.44	\$25,428.60	\$305,143.20
Post (N=12)	46 min	227	\$10,442.00	\$240	(11) x .40= \$5.28	(17)x .97= \$16.49	(10)x .48=\$4.80	\$10,708.57	\$128,502.84
Difference	65.8 min	227	\$14,936.60	\$280	(11) x .40= \$5.28	(2)x .97= \$1.94	(7)x .48=\$3.36	\$14,720.03	\$176,640.36

Chapter 5

This project was aimed at decreasing patients' PACU LOS by improving the pain management practices of nurses. Some of the results reflect the previously anticipated project outcomes. These results, if sustained, may lead to positive patient outcomes. Results of the study documented that pain was second to bed availability as the reason most indicated by nurses for a patients' increased PACU LOS (>2 hours). With the increase evidence that use of guidelines help uniform clinical practice and decrease cost (Cahill & Heyland, 2010; Dykes et al., 2005; Friedman et al., 2009; Thomas, Dhanani, Irwin, Writer & Doherty, 2010), the ASPAN Pain and Comfort guidelines were implemented. Implementation of these guidelines involved many processes and educational strategies to achieve the ultimate goal of decreasing PACU LOS. However, Cahill & Heyland, (2010) stated in their review of guideline implementation studies that "...it appears that multifaceted change strategies positively influence processes of care but had no effect on clinical outcomes" (p. 654). No effect on clinical outcomes is contrary to the findings in this project. The most significant patient outcome was the decrease in the LOS due to pain from 2.95 hours pre implementation to 1.70 hours post implementation of the ASPAN guidelines. The regional standard average LOS in a PACU is two hours and post guideline implementation, this organization was able to achieve an average of less than two hours. Klassen, Liu & Warren (2009) found similar results with a decrease in the hospital LOS by 4 to 6 days after staff received training on pain management best practices.

Despite this overall goal achievement with the decrease in the LOS, there were some unexpected results. Successful implementation of the ASPAN guidelines was based on demonstration of use rather than a pre-test/post-test mechanism because knowledge of guidelines does not necessarily translate into use of guidelines (Al-Shaer, Hill & Anderson, 2011; Cahill & Heyland, 2009). Also, Hoomans et al. (2007) found in their systematic review of empiric studies on methodological quality of economic evaluations of guideline implementation into clinical practice that a great number of studies they reviewed measured outcome effectiveness by the healthcare professionals' adherence to the guidelines. Markers of guideline utilization in this project were measured by the documented use of NSAIDS, adjuvants, patient/family education, and opioid usage. The documentation on the usage of NSAIDS and adjuvants was minimal (<60%, N=210) both pre and post implementation and the low number (N=24) of cases documented by the nurses may have contributed to the lack of significance in this area. Additionally, the underutilization of NSAIDS and adjuvants is compounded by the infrequency (2-5 times per 100 patients) of which they are ordered by the Anesthesiologist. The pain management orders at this organization are preprinted and contain a host of narcotic and non-narcotic medications including the NSAID, Ketorolac, however because of its potential to cause bleeding, it is rarely used in fresh post-operative patients. At the same time, the pre-printed order set does not include any orders for adjuvants. The use of adjuvant therapy requires additional fact finding by the anesthesiologist on the patients medication history and consultation with the patient's surgeon to put a pain management

regimen in place, which many anesthesiologists are reluctant to do. This may explain the underutilization of these drugs.

Nevertheless, it was expected that opioid usage would decrease for Fentanyl and increase for Dilaudid. Instead, the reverse occurred with opioid use in 60% of the PACU patient population occurring with Fentanyl use, while Dilaudid use remained the same. The project only included the in-patient population of patients and considering that their hospital stay would be at least 23 hours or greater, generally it is expected that patients will experience pain later during their hospital course. Therefore, it is more advantageous for the patient if a long acting pain medication is used, such as Dilaudid, for longer and better pain control (Fine & Beckanich, 2011). Fentanyl is usually the front-line drug of choice because of its quick onset of action, high potency and short half-life (Fine & Beckanich, 2011). It is possible with the added attention that was given to pain management during the guideline implementation process; the nurses had a heightened awareness for the need for pain medication and thus used this frontline drug more readily (Prior et al., 2008). Also due the heightened awareness, pain was indicated more as a LOS reason post implementation than pre implementation of the guidelines. Additionally, the increase use of Fentanyl could be the nurses' fear of over sedation with the longer acting Dilaudid. This fear ties into the knowledge and attitude of the nurses regarding pain management (Fine & Beckanich, 2011; Summers, 2001). As a result of the project the author was instrumental in redesigning the pre-printed pain orders to encourage the anesthesiologist to order a minimal amount of Fentanyl and a more generous amount of Dilaudid. In addition to this intravenous Acetaminophen was added to the order set to help decrease opioid requirements.

Another finding in this project was the difference in the patients' pain score at the time of discharge from the PACU. The pain rating was less post-implementation than pre-implementation of the guidelines indicating a positive patient outcome. This outcome could equally have resulted from the heightened awareness to pain management or the diligence of the implementation strategies. Other interventions that may have contributed to this positive outcome include: having the opinions leaders assist with the audit-feedback mechanism; the advanced pain management knowledge of the nurse practitioners, who assist in writing the pain management orders; and finally, support from the unit's management team. The challenge then becomes, after implementation, sustaining the change in practice and for the champions to remain motivated to assist in that endeavor (Friedman et al., 2009). Therefore the leadership in any organization has to remain focused and continually discuss the goals for better patient pain management outcomes. Nevertheless, greater attribution to the implementation methods could have been given if there were higher compliance in pain rating documentation which is consistent with the work of Klassen, Liu, & Warren (2009).

The increase in the documentation of patient and family education about pain management (>60% of the PACU patient population) can possibly be attributed the audit-feedback mechanism. Similarly, high post implementation pain education documentation results were found in the study done by Klassen, Liu & Warren (2009) where they found the frequency of their pain monitoring was two times greater than pre-implementation of their pain management best practice with older adults. Additionally, the organization's current inpatient education record (IPER) is formulated to facilitate documentation of pain

management education. Therefore compliance with this aspect of the guidelines was initiated with ease.

Another focus area that demonstrates use of the ASPAN guidelines is the use of non-pharmacologic measures. At the project organization, the PACU flow sheet record is not designed to document non-pharmacologic interventions which may account for the lack of documentation pre-implementation. Thus the attention given to non-pharmacologic interventions during the implementation process may account for the increase in documentation of the said methods. Currently, the healthcare system to which the project organization belongs is in the process of moving to an electronic medical record which will have a drop down screen of non-pharmacologic interventions from which the nurses will be able to choose.

Turning to cost effectiveness, the cost effectiveness of this guideline implementation yielded modest results. Not only were the cost of medications and care considered but the cost of the nurses' time away from work during the training was also considered. It is necessary to factor in implementation costs incurred by the staff as Hoomans et al. (2007) found that many economic evaluations wrongly omit this factor. Earlier calculations used to predict the cost effectiveness was done with using a larger volume of patients (N=800). However, in this project approximately half of that patient volume was obtained (N=350) possibly due to unusually low patient volume during the implementation month. Despite this lower volume, the projected annual savings with the patient population whose LOS was increased due to pain would yield almost \$177,000. Other considerations not factored into this cost analysis were the potential side effects of an increased patient LOS in the PACU

such as the delay in receiving patients from the operating room (OR) due to a capacity filled PACU. The inability of transferring patients out of the OR due to lack of space in the PACU leads to higher OR costs as the patients' charge ends with the time out of the OR.

Implementing guidelines helped to raise awareness and bring attention to the nurses' pain management practices. Also, with pain management being an important area of interest to the organization, as it relates to patient satisfaction and meeting Joint Commission regulations, organizational support played a key role in the implementation of these guidelines. The Iowa model of EBP when coupled with education, as Kowal (2010) also found in his study to implement the Critical Care Pain Observation Tool, increases the impact on nurses' use of evidence in practice. The Iowa model suggests forming a team and the team in this project consisted of nurse practitioners, opinion leaders, the medical and the unit's nursing management team. Team formation is in line with the suggestion made by Doody & Doody (2010) to have a specialist staff team to provide input during the implementation process to help achieve the desired goals. More importantly, Doody & Doody (2010) stress that regular interactions between management and direct care providers are necessary for successful use of the Iowa Model. This interactive process was achieved in this project through the use of the audit-feedback mechanism and the daily huddle reminders given by the unit managers.

At the same time, the use of Rogers Diffusion of Innovations model was similarly supported in the study done by Harting, Rutten, Rutten, & Kremers (2009) where they were examining the determinants of guideline adherence among physical therapists and they found the use of the feedback mechanism was useful, in what Rogers termed the "confirmation

stage” which discusses “maintenance” or continual usage of the guidelines (p. 225). These authors determined that if they had used an audit process in their implementation, it would have strengthened the trustworthiness of their study, which further supports the use of the audit-feedback mechanism used in this study.

Limitations

There were a number of limitations in this project. The most significant limitation was a large amount of missing data due to lack of documentation by the nurses (See Table 10). As a result, the applicability of this project to similar settings is diminished. The project organization is a unionized hospital that was in the midst of contract negotiations with the nurses’ union. Unfortunately a strike resulted during the last week of data collection. Therefore, the data were not captured for approximately 100 patients as some of the data items collected were not a part of the medical record.

As previously mentioned, the pain management practice of the nurses is also limited by the amount of pain medication the anesthesiologists prescribes which in turn may be affected by their knowledge and attitude toward pain management. The focus of this project was on nursing practice and did not encompass physician practice but one is dependent on the other. Although there was buy-in from the medical director of the PACU, she alone was not able to affect physician practice. Also the way the pre-printed PACU pain management orders were written at the time of implementation the ordered doses of Fentanyl had to be used before Dilaudid could be utilized. That was an issue because the anesthesiologist would generally order 4 to 5 repeat doses of Fentanyl. For an inpatient population who would likely experience pain beyond the PACU setting a longer acting pain medication, such as Dilaudid,

is more advantageous. So the frequent doses of Fentanyl may have resulted in a delayed use of Dilaudid amongst the nurses. Generally, the nurses would not seek the assistance of the nurse practitioner until their doses of Fentanyl were complete and this may have also been the reason for the increase use of Fentanyl and the constraint in the use of Dilaudid. Recently, the author along with the PACU medical director revised the PACU pain management orders. They have been changed to optimize the use of Dilaudid and limit the use of Fentanyl. However, the use of adjuvants, such as Ativan, Celebrex or Neurontin, which the guidelines advocate, was not included in the revised order set. This is because, as previously mentioned, the extra effort to fact find and consult with the surgeons on the patients' pain management plan is often a deterrent. Therefore the decision was made by the team to address this need at a later time and proceed with the recently accepted changes to the order set that, in the end still benefit the patient. But more recently there have been discussions amongst the Anesthesiologists on incorporating the use of Celebrex preoperatively. For now much of the focus of the anesthesiologist is channeled to the relatively new block program where patients have been identified as candidates for receiving a neuromuscular block preoperatively for pain management in the post operative phase.

Lastly, the implementation process lasted for one month. It is possible better and more definitive results could be seen if progress is monitored over a longer period of time (MacLaren & Cohen, 2005). With a higher patient volume the cost effectiveness could be better determined. Also there would be ample time for the implementation strategies to truly affect the nurses' pain management practices and solidify the acquiescence of the guidelines.

Implications

The implications of this project for nursing speak to affecting knowledge and attitude through the use of guidelines and implementation strategies and the cost effectiveness of consistent pain management. The pre-test/post-test evaluation mechanism is often used to test the acquisition of knowledge. Although the author supports demonstration of use over demonstration of knowledge, it would be desirable to combine both methodologies to better compare the effects of knowledge and attitude in guideline usage. Furthermore, it would add to the evidence that supports taking knowledge and attitude into consideration when planning educational strategies (Al-Shaer, Hill & Anderson, 2011; McLaren & Cohen, 2005).

The use of multimodal strategies for teaching is further supported by the findings from this project. Making use of educational training coupled with audit-feedback mechanism, opinion leaders and organizational involvement, adds to the existing body of evidence where these methods facilitate the implementation process and result in positive patient outcomes (Prior et al., 2008; Titler, 2007). Nevertheless, it may be better to have a longer implementation process and track progress on the use of the guidelines. It would also be advantageous to implement the guidelines in the two remaining PACUs at the project institution using the same methodology to determine if the identical results would be achieved. Additionally, it may be more advantageous to incorporate physician education and training of the guidelines and have the medical director audit their choice of medications.

Another consideration for future research is to standardize the method of assessing cost effectiveness. Hoomans et al. (2007) point out there is no general consensus on how to

factor in costs into the development and implementation of guidelines. So, further research is needed in this area to establish a method to more accurately determine cost effectiveness.

More importantly, further research can be conducted to find out the effects pain guideline implementation has on patient satisfaction. As the current health care markets move more towards value-based purchasing, consumers now have more access to view and compare hospitals on various aspects of care. Comparison information can be used to choose where to receive care, which in turn could financially affect hospital revenue.

Conclusion

Use of standardized guidelines continues to assist in uniformity of practice that positively affects patient outcomes. Structuring the guideline implementation process, with the use of the Iowa model and the Diffusion of Innovations model, help to determine organizational readiness and employ other mechanisms to support nurses at the bedside. The major findings of this project, Fentanyl use in 60% of the inpatient PACU population; overall pain rating at time of discharge decreased post implementation; increased documentation of patient/family pain management education; and namely the decrease in PACU LOS from 2.95 hours pre-implementation to 1.70hrs post-implementation all appeared to lead to positive patient outcomes. Furthermore, expansion of this project may lead to a greater realization in cost savings related to a sustained decrease in the LOS. Finally, standardized guidelines help limit the influence of knowledge and attitudes in practice and lend support to nurses to make appropriate assessments and utilize evidence-based interventions in the care of their patients.

Appendix A1

ASPAN Pain and Comfort Clinical Guideline[©]

Preoperative Phase

Assessment

1. Vital signs including pain and comfort goals (eg, 0 to 10 scale)
2. Medical history (eg, neurologic status, cardiac and respiratory instability, allergy to medication, food and objects, use of herbs, motion sickness, sickle cell, fibromyalgia, use of caffeine/substance abuse, fear, and anxiety)
3. Pain history (eg, pre-existing pain, acute, chronic, pain level, pattern, quality, type of source, intensity, location, duration/time, course, pain effect, and effects on personal life)
4. Pain behaviors/expressions or history (eg, grimacing, frowning, crying, restlessness, tension, and discomfort behaviors [eg, shivering, nausea, and vomiting]. Note that physical appearance may not necessarily indicate pain/discomfort or its absence.)
5. Analgesic history (type [ie, opioid, non-opioid, and adjuvant analgesics], dose, frequency, effectiveness, adverse effects, other medications that may influence choice of analgesics [eg, anticoagulant, antihypertensive, muscle relaxants])
6. Patient's preferences (eg, for pain relief/comfort measures, expectations, concerns, aggravating and alleviating factors, and clarification of misconceptions)
7. Pain/comfort acceptable levels (eg, patient and family [as indicated] agree to plan of treatment/interventions postoperatively)
8. Comfort history (ie, physiological, sociocultural, psychospiritual, and environment [eg, spiritual beliefs/symbols, warming measures, music, comfort objects, privacy, positioning, factors related to nausea/vomiting])
9. Educational needs (ie, consider age or level of education, cognitive and language appropriateness, and barriers to learning)
10. Cultural language preference, identification of personal beliefs, and resulting restrictions
11. Pertinent laboratory results (eg, prolonged prothrombin time [PT], partial thromboplastin time [PTT], and abnormal international normalized ratio [INR] and platelet count to determine risk for epidural hematoma in patients with epidural catheter)

Interventions

1. Identify patient, validate physician's order and procedure (ie, correct name of drug, dose, amount, route, and time, and validate type of surgery and correct surgical site as applicable)
2. Discuss pain and comfort assessment (ie, presence, location, quality, intensity, age, language, condition, and cognitively appropriate pain rating scale [eg, 0 to 10 numerical scale or FACES scale] and comfort scale. Assessment method must be the same for consistency.)
3. Discuss with patient and family (as indicated) information about reporting pain intensity using numerical or FACES rating scales and available pain

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- relief and comfort measures (include discussion of patient's preference for pain and comfort measures; implement comfort measures)
(ie, physiological, sociocultural, spiritual, environmental support as indicated by patient)
4. Discuss and dispel misconceptions about pain and pain management
 5. Encourage patient to take a preventive approach to pain and discomfort by asking for relief measures before pain and discomfort are severe or out of control
 6. Educate purpose of intravenous or epidural patient-controlled analgesia (PCA) as indicated; educate about use of nonpharmacologic methods (eg, cold therapy, relaxation breathing, music)
 7. Discuss potential outcomes of pain and discomfort treatment approaches
 8. Establish pain relief/comfort goals with the patient
(eg, a pain rating of less than 4 [scale of 1 to 10] to make it easy to cough, deep breathe, and turn); premedicate patients for sedation, pain relief, comfort (eg, non-opioid, opioid, antiemetics as ordered; consider needs of chronic pain patients)
 9. Arrange interpreter throughout the continuum of care as indicated
 10. Utilize interventions for sensory-impaired patients
(eg, device to amplify sound, sign language, and interpreters)
 11. Report abnormal findings including laboratory values (prolonged PT/PTT and abnormal INR and platelet count among epidural patients)
 12. Arrange for parents to be present for children

Expected Outcomes

1. Patient states understanding of care plan and priority of individualized needs
2. Patient states understanding of pain intensity scale, comfort scale, and pain relief/comfort goals
3. Patient establishes realistic and achievable pain relief/comfort goals
(eg, a pain rating of less than 4 [scale 0 to 10] to make it easier to cough, deep breathe, and turn upon discharge)
4. Patient states understanding or demonstrates correct use of PCA equipment as indicated
5. Patient verbalizes understanding of importance of using other nonpharmacologic methods of alleviating pain and discomfort
(eg, cold therapy, relaxation breathing, music)

Postanesthesia Phase I

Assessment

1. Refer to preoperative phase assessment, interventions, and outcomes data
2. Type of surgery and anesthesia technique, anesthetic agents, reversal agents
3. Analgesics
(ie, non-opioid, opioid, adjuvants given before and during surgery, time and amount at last dose, and regional [eg, spinal/epidural])
4. Pain and comfort levels on admission and until transfer to receiving unit or discharge to home (Reassess frequently until pain or discomfort is controlled. During sedation procedure, assess continuously.)
5. Assessment parameters
 - A. Functional level and ability to relax
 - B. Pain: type, location, intensity
(ie, using self-report pain rating scale whenever possible [age, language, condition, and cognitive appropriate tools], quality, frequency [continuous or intermittent], and sedation level; patient's method of assessment and reporting need to be the same during the postoperative continuum)

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- of care for consistency.) Note pain level at rest and during activity.
- C. Self-report of comfort level using numerical scale (0 to 10 scale) or other institutional approved instruments
 - D. Physical appearance (eg, pain/discomfort behaviors [Note: Pain behaviors are highly individual and the absence of any specific behavior, eg, facial expression, body movement, does not mean the absence of pain.])
 - E. Other sources of discomfort (eg, position, nausea and vomiting, shivering, environment such as noise, noxious smell, anxiety)
 - F. Achievement of pain relief/comfort treatment goals
6. Age, cognitive ability, and cognitive learning methods
 7. Status/vital signs
 - A. Airway patency, respiratory status, breath sounds, level of consciousness, and pupil size as indicated and other symptoms related to the effects of medications
 - B. Blood pressure
 - C. Pulse/cardiac monitor rhythm
 - D. Oxygen saturation
 - E. Motor and sensory functions post-regional anesthesia technique
- Interventions*
1. Identify patient correctly; validate physician's order; implement correct drug, dose, amount, route, and time; include type of surgery and surgical site as applicable
 2. Pharmacologic (medicate as ordered)
 - A. Mild to moderate pain—use non-opioids and may consider opioid (eg, acetaminophen, nonsteroidal anti-inflammatory drugs [NSAIDs], cyclooxygenase 2 [Cox-2] inhibitors). All the patient's regular non-opioid prescription medications should be made available unless contraindicated and per institutional approval.
 - B. Moderate to severe pain—use multimodal therapy (eg, combine non-opioid and opioid)
 - C. Utilize the 3 analgesic groups appropriately (consider multimodal therapy)
 - i. Non-opioids (eg, acetaminophen, NSAIDs, Cox-2 inhibitors); adjuvants non-opioids (acetaminophen and NSAIDs, such as aspirin, ketorolac, ibuprofen, Cox-2 inhibitors)
 - ii. μ -Agonist opioids (eg, morphine, hydromorphone, fentanyl)
 - iii. Adjuvants
 - a. Multipurpose for chronic pain (eg, anticonvulsants, tricyclic antidepressants, corticosteroids, anti-anxiety medication)
 - b. Multipurpose for moderate to severe acute pain (eg, local anesthetics, ketamine)
 - c. Neuropathic continuous pain—antidepressants, tricyclic antidepressants, oral or local anesthetic
 - d. Neuropathic lancinating pain (stabbing, knifelike pain)—anticonvulsant, baclofen
 - e. Malignant bone pain—corticosteroids, calcitonin
 - f. Post-orthopedic surgery—consider muscle relaxants if patient experiences muscle spasm
 3. Initiate and adjust IV and regional infusions (PCA) as indicated and ordered, and based on hemodynamics status (Refer to institutional permissive procedure.)
 4. Nonpharmacologic intervention use to complement, not replace, pharmacologic interventions
 5. Administer comfort measures as needed
 - A. Physiological (eg, positioning, pillow, heat and cold therapies, sensory aids [eg, dentures,

Appendix A4

- eye glasses, hearing aids]; use meperidine [Demerol] for shivering, antiemetics, eg, Reglan, Zofran as ordered)
- B. Sociocultural
(eg, family/caregiver, interpreter visit)
- C. Psychospiritual
(eg, chaplain or cleric of choice, religious objects/symbols)
- D. Environmental
(eg, confidentiality, privacy, reasonably quiet room)
- 6. Cognitive behavioral
(eg, education/instruction, relaxation, imagery, music, distraction, biofeedback)

Expected Outcomes

1. Patient maintains hemodynamic stability including respiratory/cardiac status and level of consciousness
2. Patient states achievement of pain relief/comfort treatments goals
(eg, acceptable pain relief with mobility at time of transfer or discharge)
3. Patient states he/she feels safe and secure with the instructions
(eg, use of PCA machine)
4. Patient shows effective use of at least one nonpharmacologic method
(ie, breathing relaxation techniques)
5. Patient shows effective use of PCA as indicated and discusses expected results of regional techniques
6. Patient verbalizes evidence of receding pain level and increased comfort with pharmacologic and nonpharmacologic interventions

Postanesthesia Phase II/III

Assessment

1. Refer to preoperative phase and Phase I assessments, interventions, and outcomes data
2. Achievement of pain/comfort treatment

- goals and level of satisfaction with pain relief and comfort management
- 3. Pain relief/comfort management plan for discharge and patient agreement
- 4. Educational and resource needs, considering age, language, condition, and cognitive appropriateness

Interventions

1. Identify patient correctly; validate physician's order; implement correct drug, dose, amount, route, and time
2. Pharmacologic interventions (medicate as ordered):
 - non-opioid (eg, acetaminophen, NSAIDs, Cox-2 inhibitors), μ -agonist opioids (eg, morphine, hydromorphone, fentanyl), and adjuvant analgesics (eg, local anesthetics)
3. Continue and/or initiate nonpharmacologic measures from Phase I
4. Educate patient and family/caregiver
 - A. Pain and comfort measures
 - B. Untoward symptoms to observe
 - C. Regional or local anesthetic effects dissipating after discharge (eg, numbness, motor weakness, or inadequate relief) and potential adjustments as applicable
 - D. Availability of resource as needed
5. Discuss misconceptions, expectations and implement plan of action satisfactory to patients
6. Address nausea with pharmacologic interventions or other techniques and discuss expectations

Expected Outcomes

1. Patient states acceptable level of pain relief and comfort with movement or activity at time of transfer or discharge to home
2. Patient verbalizes understanding of discharge instruction plans
 - A. Specific drug to be taken
 - B. Frequency of drug administration
 - C. Potential side effects of medication
 - D. Potential drug interactions

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ASPAN'S PERIANESTHESIA PAIN AND COMFORT CLINICAL GUIDELINE

- E. Specific precaution to follow when taking medication (eg, physical limitation, dietary restrictions)
 - F. Name and telephone number of the physician/resource to notify about pain, problems, and other concerns
3. Patient states understanding or shows effective use of nonpharmacologic methods (eg, cold/heat therapy, relaxation breathing, imagery, music)
4. Patient states achievement of pain/comfort treatment goals and level of satisfaction with pain relief and comfort management in the perianesthesia setting

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Appendix B1

ASPAN Pain and Comfort Clinical Guideline Implementation

Chioma Nwachukwu, MSN, DNP(c), RN

Pathophysiology of Pain

- Acute Pain
 - Equated to physiologic pain.
 - Transient, well localized, & proportional to the extent and intensity of the noxious stimulus.
 - Serves as a protective function
- Chronic Pain
 - Equated to pathologic pain.
 - Stimulates a depressive type response with no physiologic function

ASPAN Pain and Comfort Guidelines

- History: Initiated in 2003 with JACHO's mandate that all individuals have the right to effective pain/symptom management and this mandate should be a part of basic clinical nursing care.
- Reason for implementation
 - Uniformity in pain management approach
 - Anticipated savings after implementation is \$259,200/yr.

Assessment

- Pain history
- Pain behaviors/expressions
- Analgesic history
- Patient preferences
- Educational needs
- Pertinent laboratory results.
- Status/vital signs

Interventions

- Pharmacologic
 - Mild to moderate pain (1 to 3)—use non-opioids and may consider opioid
 - Acetaminophen, NSAIDs, Cox-2 inhibitors
 - All the patient's regular non-opioid prescription medications should be made available unless contraindicated.
 - Moderate to severe pain (3 to 6)—use a multimodal therapy.

Interventions cont.

- Severe pain (7 to 10)—utilize the 3 analgesic groups appropriately.
 - Non-opioids
 - μ -Agonist opioids
 - Morphine, hydromorphone, fentanyl
- Adjuvants
 - Multipurpose for chronic pain, e.g. anticonvulsants, tricyclic antidepressants, corticosteroids, antianxiety medication.
 - Neuropathic continuous pain—antidepressants, tricyclic antidepressants, oral or local anesthetics.
 - Post-orthopedic surgery—consider muscle relaxants if patient experiences muscle spasm.

Appendix B2

Interventions cont.

- Initiate and adjust IV and regional infusions (PCA) as indicated and ordered.
- Nonpharmacologic intervention use to complement, not replace, pharmacologic interventions.
- Administer comfort measures as needed
 - Physiologic: positioning, pillow, heat and cold therapies, sensory aids [e.g. dentures, glasses, hearing aids], control shivering, anti-emetics
 - Sociocultural: family/caregiver, interpreter
 - Environmental: confidentiality, privacy, reasonable quiet
 - Cognitive behavioral: education/instruction, relaxation, imagery, distraction.

Expected Outcomes

- Patient maintains hemodynamic stability
- Patient verbalizes evidence of receding pain level and increased comfort with pharmacologic and nonpharmacologic interventions.
- Patient shows effective use of at least one nonpharmacologic method
- Patient shows effective use of PCA as indicated and discusses expected results of regional techniques.

Data Collection Form

ASPAN Pain and Comfort Guideline Implementation Data Sheet			
Date _____			
Age _____ Sex: M _____ F _____ Race _____			
Time in PACU _____			
Pain score on admission _____ (Using numeric pain scale)			
Type of procedure _____			
Time patient recovered _____ (This time should include when pain is controlled)			
Pain score at discharge _____			
LOS Reason _____			

Audit Tool

ASPAN Pain and Comfort Guideline Audit/Feedback Tool	
Date _____	
How many times was Fentanyl used _____	N/A if epidural present _____
How many times was Dilaudid used _____	N/A if epidural present _____
Was an NSAID used? (circle one) yes no	
Was an Adjuvant used? (circle one) yes no	
Any non-pharmacologic measures documented? (circle one) yes no, if so, what type _____	
Patient/Family education documented? (circle one) yes no	
PCA education documented and pt. able to return demonstration? (circle one) yes no	

Scenario 1

- Pt. is a 27 y.o. Hispanic Male s/p open appendectomy. Ht. 5'3", Wt. 220lbs. PMH/PSH unremarkable. No meds currently. Pain on admission 8/10, VS: T-36.6, P-116, R-22, BP-145/92.
- What is your pain mgmt plan for this patient. PCA not ordered. Oral and IV analgesics ordered for the floor.

Scenario 2

- Pt. is a 65 y.o. WF s/p rt. Hip replacement. Ht. 5'5", Wt. 150lbs. PMH of arthritis, low back pain, hypertension, DM type 2, depression. PSH of lt. knee r replacement 09'. Meds: Celebrex, Percocet, Lisinopril, HCTZ, Glucophage. Pain on admission 10/10, VS: T-37.2, P-98, R-20, BP-158/89.
- What is your pain management plan. Fentanyl bolus only PCA ordered for the floor.

Appendix C1

Adapted from the ASPAN Pain and Comfort Quick Reference Guide

Pain Scales: Assessment of pain requires the use of an appropriate pain scale to best assess and systematically communicate the patient’s report of pain. Encourage adult patients to use the 0-10 (numeric or visual analog) scale to rate their pain if they are able. If patients cannot understand or are unable to respond to these, alternative scales are included in this guide.

FLACC: Total the 5 scores to obtain a scale of 0 to 10

Observation	Value = 0	Value = 1	Value = 2
FACE	Normal position or relaxed	Occasional grimace or frown	Frequent to constant frown, clenched jaw, quivering chin
LEGS	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
ACTIVITY	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, jerking
CRY	No crying, awake or asleep	Moans, whimpers, occasionally complains	Crying steadily, screams or sobs, frequently complains
CONSOLABILITY	Content, relaxed	Reassured by occasional touching, hugging, or “talking to”, distractible	Difficult to console or comfort

Intervention	Comments								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Simple Relaxation</td> <td style="padding: 5px;">Jaw relaxation</td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">Progressive muscle relaxation</td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">Simple imagery</td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">Music</td> </tr> </table>	Simple Relaxation	Jaw relaxation		Progressive muscle relaxation		Simple imagery		Music	Effective in reducing mild to moderate pain and as an adjunct to analgesic drugs for severe pain. Use when patients express an interest in relaxation. Requires 3-5 minutes of staff time for instructions.
Simple Relaxation	Jaw relaxation								
	Progressive muscle relaxation								
	Simple imagery								
	Music								

Appendix C2

Management of Opioid-induced side effects

Respiratory Depression/Excessive Sedation

- Stop opioid infusion
- Call for help
- Airway, breathing, supplemental Oxygen

- Naloxone
- Adults 0.1 – 0.2 mg IV
- May repeat every 2 to 3 minutes to desired response.

Nausea and Vomiting

Ondansetron

- Adults 4 mg IV/IM
- Administer undiluted over 1 to 5 minutes

Metoclopramide

- Adult 10 mg IV or 10 – 20 mg IM
- Give IV injection over 1 to 2 minutes

Droperidol

- Adult 0.625 – 2.5 mg IM/IV. May give additional 1.25 mg cautiously to achieve desired effect.

Indications for Nonopioid Analgesics

- Mild pain. Starting with a nonopioid acetaminophen or an NSAID alone often provides adequate relief.
- Moderate to severe pain. Pain of any severity may be at least partially relieved by a nonopioid, but an NSAID alone usually does not relieve severe pain.
- Pain that requires an opioid. Consider adding a nonopioid for the opioid dose-sparing effect.

Appendix D

Patient Data Sheet

Date _____

Age _____ Sex: M _____ F _____ Race _____

Time in PACU _____

Pain score on admission _____ (Using numeric pain scale)

Type of procedure _____

Time patient recovered _____ (This time should include when pain is controlled-may use Aldrete score, anesthesia sign-out time, time bed requested)

Highest pain level while in PACU _____ Pain score at discharge _____

PACU discharge time _____

LOS Reason _____

1. How much Fentanyl was used _____. N/A if epidural present _____
2. How much Dilaudid was used _____. N/A if epidural present _____
3. Was an Acetaminophen/NSAID/Celebrex used? (circle one) yes no
4. Was an Adjuvant used? (circle one) yes no
(e.g. Elavil, Pemelor, Prozac, Paxil, Zoloft, Celexa, Lexapro, Cymbalta, Effexor, Wellbutrin, Neurontin, etc.)
5. Any non-pharmacologic measures documented? yes no , if so, what type: (circle one)
positioning gatched knees heat cold; Comfort measures: control shivering
antiemetic sensory aids [dentures, glasses, hearing aids]
6. Epidural/Epineural/Perineural/Block present? (circle one) yes no
7. Patient/Family education documented? (circle one) yes no
8. PCA education documented and pt. able to return demonstration? (circle one) yes no
n/a

Patient Label:

Appendix E

RN's name _____

Nurse Audit/Feedback Tool

Date _____

1. How many times was Fentanyl used _____. N/A if epidural present _____
2. How many times was Dilaudid used _____. N/A if epidural present _____
3. Was an Acetaminophen/NSAID used? (circle one) yes no n/a
4. Was an Adjuvant used? (circle one) yes no n/a
(e.g. Elavil, Pemelor, Prozac, Paxil, Zoloft, Celexa, Lexapro, Cymbalta, Effexor, Wellbutrin, etc.)
5. Any non-pharmacologic measures documented? yes no, if so, what type:
(circle one) positioning gatched knees heat cold; Comfort measures: control shivering antiemetics sensory aids [dentures, glasses, hearing aids]
6. Patient/Family education documented? (circle one) yes no n/a
7. PCA education documented and pt. able to return demonstration? (circle one)
yes no

Feedback provided:

Appendix F

% Missing data

Measures	Pre	N=	Post	N=
Age	0%	0	0%	0
POA	2%	10	3.40%	12
Pain at Discharge	4%	19	24%	84
Pain relief (Pain at Discharge- POA)	5%	26	27%	93
Amt. Fentanyl	0%	0	5%	18
Amt. Diluadid	0.20%	1	5%	16
LOS	6%	34	27%	94
LOS due to pain	59%	319	43%	152
Acet/NSAID/Celebrex	0.2%	2	5%	16
adjuvant	0.0%	0	4%	13
Non-pharm	0.0%	0	3%	11
Pt./Fam education	0.2%	1	3%	9
Pain relief	5.0%	26	27%	93

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