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Preface

Pain can be defined in multiple ways. According to Kankkunen, Pietilä, Vaajoki, and Vehiläinen-Jilkunen (2010) "pain is a complex and subjective experience, which includes physiological sensory, affective, cognitive, behavioral, and sociocultural components" (p 709). The unwanted feeling of pain can only be experienced by the sufferer (Allison & Weetman, 2006). Pain is a "multidimensional phenomenon that can be described by pain location, intensity, temporal aspects, quality, impact and meaning" (Allison & Weetman, 2006). Since each individual perceives pain differently and by natural is complex, health care providers are unable to predetermine the amount of pain a patient might have after surgery (Mackintosh, 2007). The idea of having a surgery can naturally cause anxiety and fear that can lead to increased levels of pain postoperatively (Economidou, Klimi, Vivilaki, & Lykeridou, 2012). It is important for medical staff to manage pain in a holistic and multidimensional way (Kankkenen & Vaajoki, 2014). "Uncontrolled patient pain in this setting leads to prolonged postanesthesia care unit (PACU) stays, severe pain after discharge, inability to perform activities of daily living, and unplanned hospital readmissions" (Banks, 2007). This is why using pain assessment tools as well as educating patients about pain management options is key. Educating individuals preoperatively allows them to have a sense of what to expect and an understanding of the method of pain control that will be used. When patients are knowledgeable, it is more likely they will have optimal levels of pain

relief. For the health care team members, it is important to continuously assess pain levels in patients as well as continuing the patient teaching process.

Acknowledgements Page

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Abstract

This literature review examined two pharmacological forms of postoperative pain management and one nonpharmacological intervention to help reduce pain (See Appendix A). Sources were gathered from the nursing research databases of Cumulative Index to Nursing & Allied Health Literature (CINAHL) and PubMed. Articles and studies between 2004 and 2015 were analyzed to write the review. The focus was to look at postoperative patients and determine if epidural or patient controlled analgesia (PCA) provided the same satisfaction for individuals who underwent surgery. In addition, music therapy was researched to explore the effects of listening to a pleasurable sound and how it might reduce the pain experience. Although, epidural and PCA are widely used to reduce pain management in surgical patients, epidural administration was more effective in controlling pain levels but is associated with serious risks. Patient controlled analgesia allows patients to have a sense of control and reduce the level of fear associated with surgery, potential pain, and sense of inferiority.

Introduction

Postoperative pain management is a topic of discussion for about 51.4 million individuals and families throughout the United States each year (CDC/National Center for Health Statistics, 2014). Epidurals and patient controlled analgesia are examples of interventions to help reduce pain in surgical patients. Since opioid medications are being administered, adverse effects are commonly experienced with the use of narcotics. Nonpharmacological interventions, such as music therapy, are available options to combine with medications to help lower pain levels and increase patient satisfaction. Epidural infusion of opioids in combination with music therapy would be able to provide optimal patient satisfaction and diminished pain sensations. The purpose of this paper is to 1) review pain assessment tools, 2) describe epidural and patient controlled analgesia as pain management options, and 3) introduce music therapy as an alternative method for pain reduction.

Pain Assessment Tools

Today, there are a variety of different pain assessment tools that are used for specific patient populations. Some of these tools are The Faces of Pain Scale (FPS), The Wong-Baker FACES of pain scale, the Visual Analogue Scale (VAS), and the Numerical Rating Scale (NRS). The primary use of these tools is to allow patients to describe their pain to the medical staff, so the health care professionals can take the proper steps to provide patient comfort. In other words, pain is described as subjective because each individual has a different pain perception and tolerance. The use of these different assessment tools is an attempt to make something that is subjective objective (Brown, 2008). As well as helping patients report pain, the assessment tools prevent bias and error (Brown, 2008). Along with using the different assessment tools, it is also important to ask the patient about the characteristics of his or her pain. These characteristics include: the location, intensity, quality, onset, words to describe the pain, the patient's preferred method of relieving the pain, factors that increase or decrease pain, and the effect of pain on the patient (Mackintosh, 2007).

The different pain assessment scales vary in how the assessment is administered and characteristics of the scales themselves. According to Brown (2008), the FPS consists of "six facial expressions that range from a smile through a grimace" (See Appendix B). Underneath the faces, there are numerical values. The patient is asked to pick the face that best represents his or her pain level (Brown, 2008). The Wong-Bakers FACES is very similar to the FPS. It uses facial

expressions along with a numerical pain scale (See Appendix C). At zero, there is a smiling, cheerful face while the ten is represented with a crying face. Each number corresponds with a facial expression. As the numbers increase from zero to ten, the facial expressions gradually shift from a content, peaceful expression to a tearful and melancholic expression (Brown, 2008). The Visual Analogue Scale is a pain scale from zero to ten (See Appendix D). The number zero represents no pain while the ten represents the 'worst possible pain' the patient has experienced (Brown, 2008). According to "Postoperative Pain Assessment Tools in Day Surgery: Literature Review," Ameen, Coll, and Mead (2004) concluded that the Visual Analogue Scale was the most efficient and was easily understood by patients. The authors agreed that this pain scale should be used when assessing postoperative pain (Ameen, Coll, & Mead, 2004). The Numerical Rating Scale is set up the same as the VAS (See Appendix E). This pain scale ranges from zero to five or from zero to ten. This assessment tool is valuable when the patient is unable to tolerate multiple questions due to the severity of the pain. The NRS allows medical staff to quickly and accurately have an understanding of the pain intensity the individual is experiencing. The benefit of this tool is it has the ability to pick up on subtle changes in a patient's pain intensity (Brown, 2008). Once the tool, that is being used, is explained to the patient, he or she will rate his or her pain accordingly.

Pain scales are an important part of the assessment process. By allowing health care professionals to have an understanding of the pain intensity and characteristics the patients are experiencing, the medical staff can treat the pain

accordingly to make patients more comfortable. Pain assessment tools should be easily understood and explained to patients, to facilitate effective communication is present. The most appropriate scale should also be chosen for the specific patient population the health care team member is trying to assess (Brown, 2008). The chosen pain scale should be used during each assessment and the time in between. A health care professional should not use multiple scales to assess one person's pain intensity throughout a shift.

Epidural for Pain Management

The use of administering analgesia through an epidural infusion is beneficial for postoperative patients. Infusions of analgesia through an epidural decrease the risks associated with surgery and also provides appropriate pain relief for patients (Allison & Weetman, 2006). Epidural infusion consists of the patient receiving a local anesthetic and opioids. "Perianesthesia Epidural Resource" explains that spinal nerve impulses are blocked by the infusion of the local anesthetics while the opioids block the opioid receptors located within the spinal cord (See Appendix F). A decreased amount of opioids are necessary when administered with local anesthetics because the anesthetics have an opioid sparing property, which is why the two are used in epidural infusions (Banks, 2007). By administering low levels of opioid medications, the patient will experience less severe adverse effects than someone who is receiving high doses of this type of pain medication (Banks, 2007).

Levobupivacaine is a common local anesthetic that is used to help control postoperative pain along with the administration of an opioid. Common side effects associated with this medication include: dizziness, fever, itchiness, nausea, and vomiting. Bupivacaine is another local anesthetic that is used with epidurals. This medication produces serious adverse effects, such as central nervous system depression, respiratory arrest, and heart block, compared to levobupivacaine. Bupivacaine and ropivacaine are two of the most commonly administered medications through epidural catheters (Banks, 2007). A study conducted by Erdemli, Saracoglu, Tolga Saracoglu, and Uzuner (2011) suggests that "epidural

levobupivacaine and bupivacaine with fentanyl provide stable postoperative analgesia and both were found safe for patients." In the study, the average pain rating when using the Visual Analogue Scale was the same between the group who received bupivacaine with fentanyl and the group who received levobupivacaine with fentanyl (Erdemli, Saracoglu, Tolga Saracoglu, & Uzuner, 2011). These medications are used in epidural infusions to increase patient comfort and to improve patient satisfaction.

Once an epidural infusion is no longer necessary for the recovering patient, he or she must be transitioned to an oral analgesia. Typical, the amount of opioid medication that is being administered to the postoperative patient is reduced by the third day. Throughout this transition time, pain assessment tools are used to determine pain levels in patients. By gathering this information, the medical staff can treat the pain intensity accordingly. Once the epidural is discontinued, oral pain medication is introduced to the patients care. It is key to continue to monitor the discomfort level so reduced pain is achieved. In the study by Brown and O'Neill (2007), the results suggested that the "patients who received bupivacaine only before discontinuation of their epidural reported less pain." Slowly tapering the amount of opioid infused through the epidural is one of the key factors to weaning a patient, so the epidural can be discontinued while maintaining low pain ratings. The researchers did not find a difference between immediate or sustained release analgesics on the patients' pain level over a period of time, but the timing of oral

pain medication is extremely important to maintain patient comfort and satisfaction.

The medical staff working with epidurals should be knowledgeable about the medications and equipment associated with this method of pain relief as well as having an understanding of the epidural space (Allison & Weetman, 2006). Continuous education to the health care team members should be provided on pain management, pain assessment tools, and the transition from epidural to oral administration. Individual pain assessments should determine the method of pain management for each patient.

Patient Controlled Analgesia for Pain Management

Patient controlled analgesia (PCA) is another popular way to manage postoperative pain. This method of pain management allows the patient to be involved and in control. Patients also has decreased feelings of "powerlessness and vulnerability" when PCA is implemented (Yankova, 2008). The pumps deliver small doses of medication through an IV site over time (See Appendix G). Since the pain medication is being administered frequently, there is a stead, even level of the analgesia located within the body to keep pain levels low and the patient more comfortable (Vockley, 2013). When a patient starts to have increased pain or knows he or she will be moving around, the patient can press the button to have to drug administered. If the PCA pump beeps, it means the patient has received the medication (Vockley, 2013). When the pump does not beep, the patient has not

received the preprogrammed dose because there is a lock-out or the patient has pressed the button too frequently. This is one feature that promotes patient safety.

The patient and family should be informed that the patient should be the only individual to press the button on the device. Opioids naturally produce a sedated affect on patients, which causes respiratory depression (Lattavo, 2010). "Respiratory depression can be defined as a decrease in the rate and depth of respirations from baseline" (Lattavo, 2010). When patients become "too sleepy, they will be unable to administer any further dose" (Lattavo, 2010). So if someone other than the patient is administering the medication, the individual has a higher risk of developing respiratory depression (Lattavo, 2010). Routine sedation assessments should occur to promote patient safety and will inform nurses when they should intervene. During these assessments, nurses should be looking at how quickly a patient arouses to a stimulus, his or her ability to stay awake, and the patient's ability to answer easy, routine questions (Lattavo, 2010).

Some of the common medications used to treat pain through PCA devices are morphine, hydromorphine, and fentanyl. These opioids work by "binding to opioid receptors in the brain, spinal cord, gastrointestinal and urinary tracts, lungs, and peripheral nerve endings" to relieve pain (Macintyre & Schug, 2007). Each drug has its own parameters when being administered through patient controlled analgesia pumps. For example, the parameters for morphine are "1-mg to 2-mg bolus, six minute lock-out interval, and self-administration dose of 1.5mg to 3mg per hour" (Hicks, R., Hernandez, J., & Wanzer, L., 2012). Hydromorphine is stronger than

morphine since 1-mg to 2-mg is the same as 10-mg of morphine. On the other hand, fentanyl is about "75 to 100 times more potent than morphine" (Hicks, R., Hernandez, J., & Wanzer, L., 2012). Common opioid side effects include: constipation, respiratory depression, sedation, dizziness, nausea, vomiting, and physical dependence. Although this form of pain relief comes with high risks, it is a method that can provide patient comfort and reduce fear by allowing the patient a sense of control.

Patient controlled analgesia increases patient satisfaction by allowing patients to have control and also help decrease common opioid side effects compared to other routes of administration. It is important to educate patients prior to surgery about PCA as an option for postoperative pain management. By providing this education, patients will be well informed and would be able to "obtain optimal pain relief by using the PCA device" (Yankova, 2008).

Epidural versus Patient Controlled Analgesia

Epidurals and patient controlled analgesia have both advantages and disadvantages. Some of the advantages to using PCA devices are the patients feeling a sense of control, reduced anxiety and fear, and being able to move around more (Healthwise Staff, 2014). On the other hand, epidurals allow for increased mobility for the first two days after surgery because this method keeps patients comfortable and reduces pain levels (Azizi, Beaussier, Biermann, El'Ayoubi, Eledjam, Gervaz, Lienhart, Mazoit, Parc, Rohr, Rollin, & Schiffer, 2007). Although there are positives to PCA and epidurals, there are also negatives that we try to

avoid. For example, risks associated with epidural placement include spinal hematoma and abscess.

Patients, who receive pain medication through epidurals, can also experience side effects, such as numbness, motor block, nausea, vomiting, itchiness, and low blood pressure (Viscusi, 2007). Even though there are serious risks associated with epidurals and epidural placement, this method of pain relief is superior to patient controlled analgesia. Analysis of research data supports "that post-operative epidural analgesia provided significantly better post-operative analgesia than parenteral therapy" (Viscusi, 2007). Along with providing optimal pain relief for patients, the use of an epidural also allows for early mobility, increase the activity of the gastrointestinal tract, shortens the length of stay at the hospital, and decreases morbidity associated with the cardiovascular system (Eledjam, Mann, & Pouzeratte, 2003). Patients, who use epidurals for pain management, do not need additional interventions for pain 70% of the time (Viscusi, 2007).

Patient controlled analgesia is another widely used form of postoperative pain management, but there is also high risk for error with these devices. Studies have been conducted in regards to errors with patient controlled analgesia. The studies have examined if errors occur due to "operator error, patient error, or device malfunction" (Clark, Hankin, Panchal, & Schein, 2007). It has been concluded that the most common error is incorrect programming of the PCA pump by the health care personnel (Cousins, Hicks, Nelson, Schein, & Sikirica,, 2008). Another common error is the "improper dosage or quality of analgesic medication" (Cousins, Hicks,

Nelson, Schein, & Sikirica,, 2008). Device malfunction can occur, but studies show that it is a rare occurrence for these pumps to experience technical glitches (Clark, Hankin, Panchal, & Schein, 2007). Operator errors can occur by individuals being distracted while setting up the pump or gathering the wrong supplies and medication to do so. It is important to have another registered nurse to verify the medication order and pump settings before starting the device. Protocols should be implemented to promote patient safety and to help prevent medication errors with opioid medications.

Overall, health care team members should be aware of near misses and risks for errors. By thinking about ways to improve patient safety, new methods and protocols can be created and implemented to prevent patient harm. Medication errors can be reduced by hospital staff focusing solely on the medication and administration process rather than multitasking or talking to other individuals while handling the drugs. Working as a team and having peers double check orders and pump settings for opioid administration can also reduce the risk for errors. Safe guards should be created and implemented to allow PCA and epidural methods of pain management to be as safe as possible for patients and to allow optimal pain relief.

Music Therapy

Music therapy along with analgesic administration has been known to decrease levels of pain in postoperative patients. Research has determined that the combination of pain medication and listening to music can improve pain by 23% and

can be a potential opportunity to help prevent chronic pain (Kankkenen, P. & Vaajoki, A., 2014). Due to the variety of genres of music and cultural backgrounds, it is important to allow patients to determine the kind of music that will be played. An individual's age, culture, and familiarity with music are three factors that can affect a person's genre preference (Kankkenen, P. & Vaajoki, A., 2014). Along with considering these key factors, it is also important to inform patients about music therapy as a pain management option (Kankkenen, P. & Vaajoki, A., 2014). Not only does music reduce pain, it also can help fear and stress levels among postoperative patients. Music can act as a distraction as well as inhibiting the pain pathways in the human body. "The activation of auditory pathways may play a role in inhibiting the central transmission of painful stimuli" since the auditory and pain pathways can inhibit one another (Dagli, G., Kilic, E., Özkan, S., Sen, H., Sizlan, A., & Yanarates, Ö., 2010). It also helps improve patient satisfaction by decreasing the noise levels he or she is able to hear along with decreasing negative experiences while in the hospital (Comeaux, T. & Steele-Moses, S., 2013). Another benefit of music therapy is that it is a side effect free intervention. It can only improve the patients overall hospital experience.

Many studies have been conducted to support that listening to music can help decrease pain levels and analgesic consumption by postoperative patients. According to the "Effects of Music on Vital Signs and Postoperative Pain," patients, who listened to music, had lower opioid consumption postoperatively and decreased respiration rates preoperatively. Due to the patients listening to music before and

after surgery, the participants experienced less anxiety and increased levels of comfort (Effects of music on vital signs and postoperative pain, 2004). The patients, who listened to music, had an improved well – being compared to the individuals, who did not (Effects of music on vital signs and postoperative pain, 2004). Kankkenen and Vaajoki (2014) stated that "music triggers positive physiological responses, such as reduced blood pressure and respiratory rates" and that it "provides a health environment, enhances the quality of their hospital stay and is an integral part of the multimodal regimen." In "The effect of complementary music therapy on the patients' postoperative state anxiety, pain control, and environmental noise satisfaction, " Comeaux and Steele-Moses (2013) discovered that pain management and environmental noise satisfaction were significantly different. Although the study showed that music therapy affected pain level and noise satisfaction, it did not affect anxiety levels in the patients (Comeaux, T. & Steele-Moses, S., 2013).

Another study was conducted to "find out the effect of music therapy on postoperative analgesia and second to determine the duration of its effect" (Dagli, G., Kilic, E., Özkan, S., Sen, H., Sizlan, A., & Yanarates, Ö., 2010). The results of the single blinded study were that the participants in Group 1, the music group, had less patient controlled analgesia by the fourth hour after surgery than Group 2. The total amount of tramadol consumption, lower pain levels, and higher satisfaction scores were also characteristics of Group 1 (Dagli, G., Kilic, E., Özkan, S., Sen, H., Sizlan, A., & Yanarates, Ö., 2010). It is important for post surgery

patients to move around in and out of bed along with taking deep breaths, which is why decreasing pain levels and improving patient comfort is a high priority. A study conducted by Kankkunen, Pietilä, Vaajoki, and Vehiläinen-Jilkunen in 2010 discovered that music therapy helped relieve mild pain while patients were participating in these activities.

Overall, music therapy is recommended for patients undergoing surgery. Research supports that music is an inexpensive intervention that does not produce side effects. Music helps reduce pain levels, anxiety, the consumption of pain medication, and satisfaction in postoperative patients. Patients should have the opportunity to bring their own music or have music therapy be an option along with analgesic administration (Economidou, E., Klimi, A., Vivilaki, V., & Lykeridou, K. 2012). Nursing and hospital staff should be informed about the benefits of music therapy on surgical patients over all well-being and experience. "Music's Use for Anesthesia and Analgesia" supports that music should be offered to patients and that it helps isolate patients from the loud, busy atmosphere of the hospital. A recommendation for clinical practice is to have nurse managers to "consider purchasing MP3 players inscribed with their hospital logo for the patients to keep, thus promoting the intervention after discharge" (Comeaux, T. & Steele-Moses, S., 2013). Based on these studies, music therapy should be explained and offered to patients, who are undergoing surgery. It is a nonpharmacological intervention that can help decrease pain levels and increase patient comfort while in the hospital.

Although there is research suggesting that music therapy has positive effects on postoperative patients, additional research is still necessary.

Conclusion

It is important for health care providers to inform surgical patients about their options for pain control. Two of the most common methods are patient controlled analgesia and epidurals. It has been concluded based on research that epidurals as a source of pain management provide more benefits for patients. On the other hand, there are also serious risks that are involved with the placement of the catheter. PCA pumps allow the patients to have a sense of control to help reduce fear and improve patient satisfaction. Teaching patients about the benefits of music therapy in combination with opioid consumption is another method to reduce pain, decrease the amount of opioids consumed, and increase patient satisfaction during their inpatient stay at the hospital. Further research should be conducted on these three topics to have a better understanding of the positive effects and benefits on patients.

Appendix A

Literature Review and Study Research Table

Assessment Tools

Article	Author & Year	Purpose	Methods	Results	Conclusion	Citation
Pain assessment in the recovery room	Donna Brown 2008	- To look at the different pain assessment tools	- Describes each assessment tool		- The tools should be simple and easy to understand - Make sure the tools are reliable	Brown, D. (2008). Pain assessment in the recovery room. *Journal of Perioperative Practice*, 18.
Postoperative pain assessment tools in day surgery: literature review	Anna Coll, Jamal Ameen, & Donna Mead 2004	- VAS and measuring pain intensity in postoperative patients	- "The keywords: postoperative pain, day surgery, ambulatory surgery, rating scales, VAS, severity, assessment, tool, nursing, validity, sensitivity, reliability and their various combinations. The databases used were Medline, CINAHL, Nursing Collection, Embase, Healthstar, BMJ and several on-line Internet journals, specifically Ambulatory Surgery. The search included only papers published in the English	- VAS seemed to be the best option and most suitable to assess pain in day surgery	Guidelines should be created as well as making sure a common definition. Need to make sure the information gathered from the tool is reliable	Ameen, J., Coll, A., & Mead, D. (2004). Postoperative pain assessment tools in day surgery: literature review. *Journal of Advanced Nursing*, 46.

			Language"			
Assessment and management of patients with post-operative pain	Carolyn Mackintosh 2007	- To look at the assessment and management of pain, following surgical procedures	Pain assessment factors: location, intensity, quality, onset, words to describe the pain, patient's preferred method of relieving pain, factors that increase or decrease pain, the effect of pain on the patient.	- Discusses the different types of pain management methods.		Mackintosh, C. (2007). Assessment and management of patients with post-operative pain. *Nursing Standard*, 22.

Epidural

Article	Author & Year	Purpose	Methods	Results	Conclusion	Citation
Post-operative pain management transition from epidural to oral analgesia	Donna Brown & Olga O'Neill 2007	- To examine current pain management practices and transitioning from epidural to oral analgesia	- 100 patients – general or thoracic surgery - Three available solutions ~ 0.1% bupivacaine and fentanyl 5 mcg/ml -1 ~ 0.1% bupivacaine and fentanyl 2 mcg/ml -1 ~ 0.1% bupivacaine	- "24 hours after the epidural was discontinued revealed that 60 percent of patients in each group stated that their pain remained the same, whereas 36 percent of patients who received bupivacaine only and 28 percent of patients who received bupivacaine and fentanyl 2 mcg/ml -1 stated that their pain increased in the 24 hours following discontinuation of epidural analgesia."	- Individual approach should be used in regards to pain management - Determine ways pain assessment practices can be improved - The timing of administering oral pain medication is key when transitioning from epidural to oral analgesia.	Brown D. & O'Neill, O. (2007). Post-operative pain management transition from epidural to oral analgesia. *Nursing Standard*, 21.
Use of epidural analgesia in	Caroline Weetman	- Information on epidural	- Basic info about epidurals		- Epidurals provide	Allison, W. & Weetman, C.

post-operative pain management	& Wendy Allison 2006	infusion and how it managements postoperative pain	in this article		patients with optimal pain relief in postoperative patients - Nursing staff must be knowledgeable about all aspects of epidurals	(2006). Use of epidural analgesia in post-operative pain management. *Nursing Standard*, 20.
The comparative study of epidural levobupivacaine and bupivacaine in major abdominal surgeries	Ali Uzuner, Kemal Tolga Saracoglu, Ayten Saracoglu, Ozcan Erdemli 2011	The goal "was to compare the levobupivacaine-fentanyl solution with bupivacaine-fentanyl solution to determine the analgesic, hemodynamic and arrhythmogenic activity by recording VAS scores, arterial blood pressure and holter monitorisation."	- 50 patients - The parameters: Group I (n=25), bupivacaine with fentanyl solution and Group II (n=25), "levobupivacaine with fentanyl solution was infused via epidural patient-controlled analgesia (PCA)." examined four catagories: "ventricular arrhythmia (VA), supraventricular arrhythmia (SVA), atrioventricular conduction abnormalities and pauses longer than two seconds."	- Mean VAS scores were not significantly different. SVA was higher in group I	- "Same concentration of epidural levobupivacaine and bupivacaine with fentanyl provide stable postoperative analgesia and both were found safe for the patients"	Erdemli, O., Saracoglu, A., Tolga Saracoglu, K., & Uzuner, A. (2011). The comparative study of epidural levobupivacaine and bupivacaine in major abdominal surgeries. *J Res Med Sci*, 16.
Innovations in postoperative pain management: Continuous infusion of local anesthetics	Banks 2007	Provided basic information on the different patient settings and pain management practices				Banks, A. (2007). Innovations in postoperative pain management: Continuous infusion of local anesthetics. *AORN Journal*, 85.
Emerging treatment modalities: Balancing	Viscusi 2007	Examined the advantages and disadvantages of PCA			PCA is a common method used for pain	Viscusi, E. (2007). Emerging treatment

efficacy and safety					control, but users must be aware of potential technological issues	modalities: Balancing efficacy and safety. *American Journal of Health-System Pharmacy*, 64.
Continuous preperitoneal infusion of ropivacaine provides effective analgesia and accelerates recovery after colorectal surgery: a randomized, double-blind, placebo-controlled study	Azizi, Beaussier, Biermann, El'Ayoubi, Eledjam, Gervaz, Lienhart, Mazoit, Parc, Rohr, Rollin, & Schiffer, 2007	The effects of ropivacaine and postoperative pain management	- 21 patients in each group - patient randomly assigned to groups - received normal saline or ropivacaine	Ropivacaine reduced pain levels and decreased the need for morphine consumption in the first 72 hours.	- Continuous administration of ropivacaine improve pain relief and decreased the amount of morphine consumed	Azizi, L., Beaussier, M., Biermann, C., El'Ayoubi, H., Eledjam, J., Gervaz, P., Lienhart, A., Mazoit, J., Parc, Y., Rohr, S., Rollin, M., & Schiffer, E. (2007). Continuous preperitoneal infusion of ropivacaine provides effective analgesia and accelerates recovery after colorectal surgery: a randomized, double-blind, placebo-controlled study. *Anesthesiology*, 107.

Patient Controlled Analgesia

Article	Author & Year	Purpose	Methods	Results	Conclusion	Citation
Innovations in postoperative pain management: Continuous infusion of local anesthetics	Angela Banks 2007	- To educate "perioperative nurses and other health care providers about recent innovations in continuous local anesthetic infusion for postoperative pain management."	- Traditional Pain Management: "patients experience pain in response to tissue damage that triggers the release of prostaglandin, histamine, and serotonin." Pain medication can cause many side effects: nausea, excessive	Information on infusion pumps included	Provided basic information on the topic to allow readers to have a better understanding of continuous infusion of local anesthetics	Banks, A. (2007). Innovations in postoperative pain management: Continuous infusion of local anesthetics. *AORN Journal*, 85.

			sedation, and respiratory depression - "Increased number of postoperative patients receiving continuous infusion of local anesthetics to manage pain."			
Silent danger opioids, PCA pumps, and the case for continuous monitoring.	Vockley 2013	Addresses the dangers involved with PCA	Uses real life examples to discuss the dangers	Explains patient controlled analgesia		Vockley, M. (2013). Silent danger opioids, PCA pumps, and the case for continuous monitoring. *Biomedical instrumentation & technology*.
Safe use of patient-controlled analgesia on a medical-surgical unit	Lattavo 2010	Explain PCA and safety	Discuss the different types of errors that can occur in detail			Lattavo, K. (2010). Safe use of patient-controlled analgesia on a medical-surgical unit. *Academy of Medical-Surgical Nurses*, 19.

Music Therapy

Article	Author & Year	Purpose	Methods	Results	Conclusion	Citation
Effect of Music on Vital Signs and Postoperative pain	Eleni Ikonomidou, Anette Rehnström, & Ole Naesh August 2004	The effects of music on nausea, pain, and well being preoperatively and postoperativel y	- 1,200 bed hospital in Sweden. - Informed consent gathered from 60 patients, ages of 25 and 45. - Randomly assigned to group M (those who listened to music) or group C (those who listened to a blank CD) - Dependent variables: pain, nausea, well-being,	- No significant difference for pain, heart rate, blood pressure, or postoperative respiratory rates in the two groups. - Respiratory rate was significantly lower in the music group preoperatively. - Postoperatively , patients in the music group tended toward an improved well-being.	- Lower levels of opioids were administered to the music group. - Rest and relaxation time help lower pain levels and positively affect vital signs. - Music helped improve patient comfort and satisfaction overall.	Effect of music on vital signs and postoperative pain. *AORN Journal*, 80.

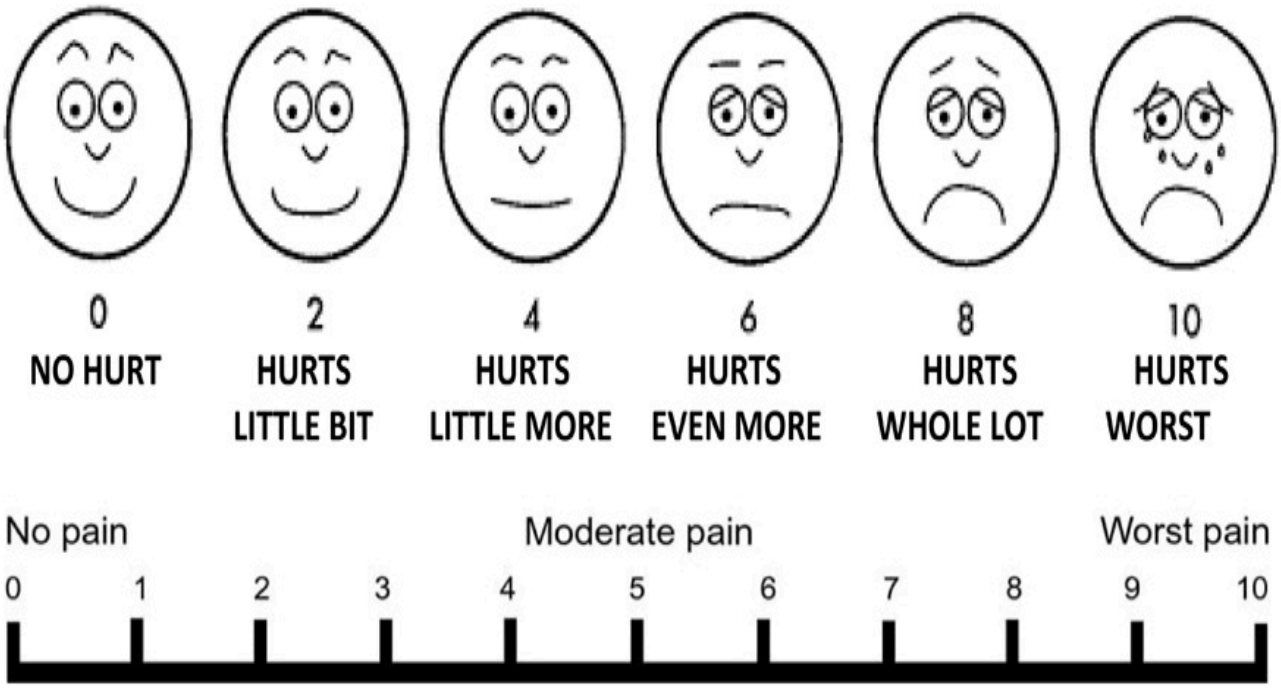
			vital signs, and total dose of analgesics and antiemetics administered during the recovery period. - Pain measured using a visual analogue scale (VAS) endpoints zero (no pain) and 100 (worst thinkable pain) - Nausea was measured on a similar scale. - Well being was measured on a VAS - All measurements taken by one researcher. - Patients listened to music for thirty minutes and then filled out a measurement tool.			
The Efficiency and Duration of the Analgesic Effects of Musical Therapy on Postoperative Pain	Hüeyin Sen, Ömer Yanarates, Ali Sizlan, Emre Kilic, Sezai Özkan, Güner Dagli October 2010	Music therapy and its effects of analgesia administration	- Single blinded. 20-40 years old. - Randomly placed in two groups - Group 1 – the music group - Group 2 – did not listen to music	- At 4th hours post-op, group 1 decreased frequency of PCA medication administration. - 24 hours after surgery, group 1 had lower total tramadol consumption - Satisfaction was higher in group 1 and VAS scores were lower in group 1	- Pain and auditory pathways inhibit one another - Music decreased pain levels and the need for tramadol consumption - Further studies should be conducted	Dagli, G., Kilic, E., Özkan, S., Sen, H., Sizlan, A., & Yanarates, Ö. (2010). The efficiency and duration of the analgesic effects of musical therapy on postoperative pain. *AGRI*, 22.

Effects of Listening to Music on Pain Intensity and Pain Distress After Surgery: an intervention	Anne Vaajoki, Anna-Maija Pietilä, Päivi Kankkunen, and Katri Vehiläinen-Jilkunen September 2010	- How music affects pain intensity and distress in postoperative patients	- 42 men and 41 women in the music group and the average age was 60. - 48 men and 37 women in the control group and the average age was 63. - Kuopio University Hospital in Finland - Music group and control group - At least 83 participants in each group - Music group heard music seven times. Kuopio University Hospital in Finland - Randomly placed in to a group - VAS used to assess pain	- No significant difference between scores on the first day. On the second day, the control group had higher pain levels and distress.	- Decrease pain levels for patients in the music group on day 2 after surgery - Music helps reduce distress and pain levels - Further studies are needed	Kankkunen, P., Pietilä, A., Vaajoki, A., & Vehiläinen-Jilkunen, K. (2010). Effects of listening to music on pain intensity and pain distress after surgery: an intervention. Journal of Clinical Nursing, 21.
Songs for Silent Suffering: could music help with postsurgical pain? Review of literature	Päivi Kankkunen & Anne Vaajoki 2014	- Music therapy and pain medications produces improved pain alleviation in patients	- Prerecorded music was played through headphones - Simple intervention to help reduce pain and promotes a positive environment		- Provide information on music therapy to patients - Consider individuals culture and its affect of music preference - Further research should be conducted	Kankkenen, P. & Vaajoki, A. (2014). Songs for silent suffering: could music help with postsurgical pain?. *Future medicine*, 4.
The effect of complementar y music therapy on the patients' postoperative state anxiety, pain control, and environmental noise satisfaction	Tressa Comeaux and Susan Steele-Moses 2013	- Effects of music on anxiety, pain, environment noise, and patient satisfaction	- Quasi experimental study and patients were assigned to a group based on their room number. - Received music therapy through a pre-programmed	- Significant difference between the music group and control group in regards to pain and environment noise satisfaction. - No effect on	- Use of music helps increase patient satisfaction levels and reduce pain. - Hospitals should have MP3 players to distribute to patients to help	Comeaux, T. & Steele-Moses, S. (2013). The effect of complementar y music therapy on the patients' postoperative state anxiety, pain control, and

			MP3 player along with the standard of care. - Non-lyrical music and should listen to it for at least 30 minutes - "Consists of three groups: control, music therapy, and white noise therapy." - Anxiety was measured with the state trait anxiety inventory (STAI)	anxiety	encourage the intervention after discharge	environmental noise satisfaction. *Medsurg Nursing*, 22.
Does music reduce postoperative pain? A review	Electra Economidou, Amalia Klimi, Victoria Vivilaki, & Katerina Lykeridou 2012	- Analyze literature on the effects of music therapy on pain levels	- Adult patients, major elective surgery under general anesthesia and requires post op pain relief. - Intervention is music - Randomized control trial	- "Exclusion criteria included review articles, studies with qualitative design, studies that did not include music in the intervention, and studies that used sounds instead of music and those who used combination of music with other methods such as relaxation"	- Music should be offered to postoperative patients. - Recommended that music therapy should be used to help reduce anxiety, pain levels, and stress after surgery s	Economidou, E., Klimi, A., Vivilaki, V., & Lykeridou, K. (2012). Does music reduce postoperative pain? A review. *Health Science Journal*, 6.

Appendix B

The Faces of Pain Scale can be used with older adults and children to help determine pain intensity. The scale allows the patient to point towards the facial expression that closely displays the level of pain he or she is experiencing at that moment. The faces correspond with numbers ranging from zero to ten. On the far left, zero represents no pain. On the right, the number ten represents the worst possible pain. This assessment tools allows individuals to easily express pain intensity to health care personnel (Sigma Theta Tau International Honor Society of Nursing, n.d.).

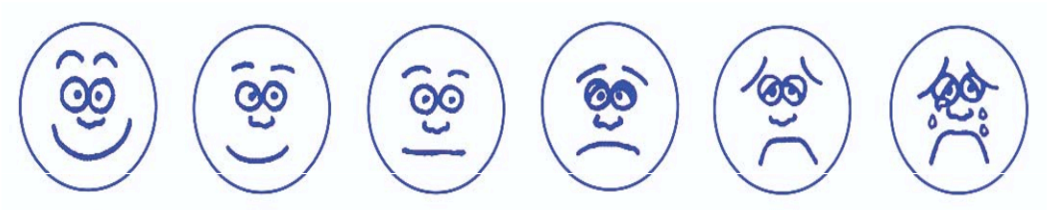


[Untitled image of the Faces Pain Rating Scale] Retrieved March 6, 2015 from http://disabilityintersections.com/wp-content/uploads/2014/02/Pain-Scale-Graphic.jpg.

Appendix C

The Wong-Baker FACES Pain Rating Scale was created by Dr. Donna Wong and Connie Baker to form an assessment tool to determine pain levels in children. The two women worked together in Tulsa, Oklahoma on a burn unit. Wong and Baker discovered that the children present on the unit were having difficulty expressing their pain levels to the medical staff. The two women started to think of a solution to this particular problem. The ladies noticed children seemed to understand how to express themselves through the use of drawings with facial expressions rather than numerical values. Thus, the Wong-Bakers FACES Pain Rating Scale was created (Baker, 2009).

Wong-Baker FACES Pain Rating Scale



Explain to the person that each face is for a person who feels happy because he has no pain (hurt) or sad because he has some or a lot of pain. Face 0 is very happy because he doesn't hurt at all. Face 1 hurts just a little bit. Face 2 hurts a little more. Face 3 hurts even more. Face 4 hurts a whole lot. Face 5 hurts as much as you can image, although you don't have to be crying to feel this bad. Ask the person to choose the face that best describes how he is feeling.

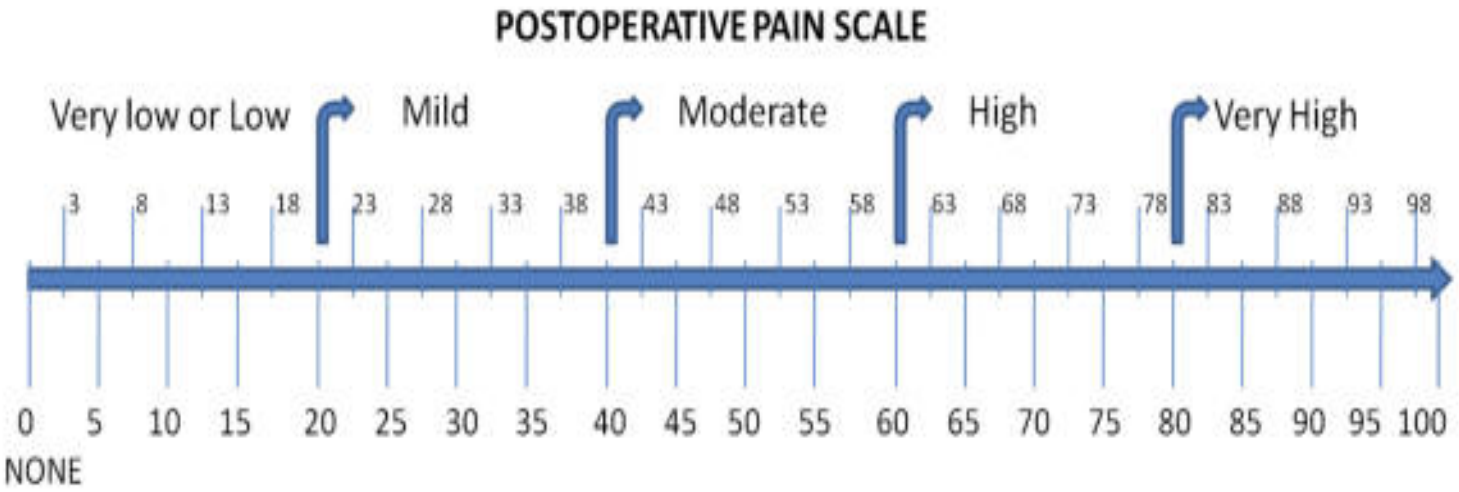
Rating scale is recommended for persons age 3 years and older.

Brief word instructions: Point to each face using the words to describe the pain intensity. Ask the child to choose face that best describes own pain and record the appropriate number.

[Untitled image of Wong-Baker Faces Pain Rating Scale] Retrieved March 6, 2015 from http://addpsd.com/images/Wong-Baker%20Faces%20Pain%20Scale.

Appendix D

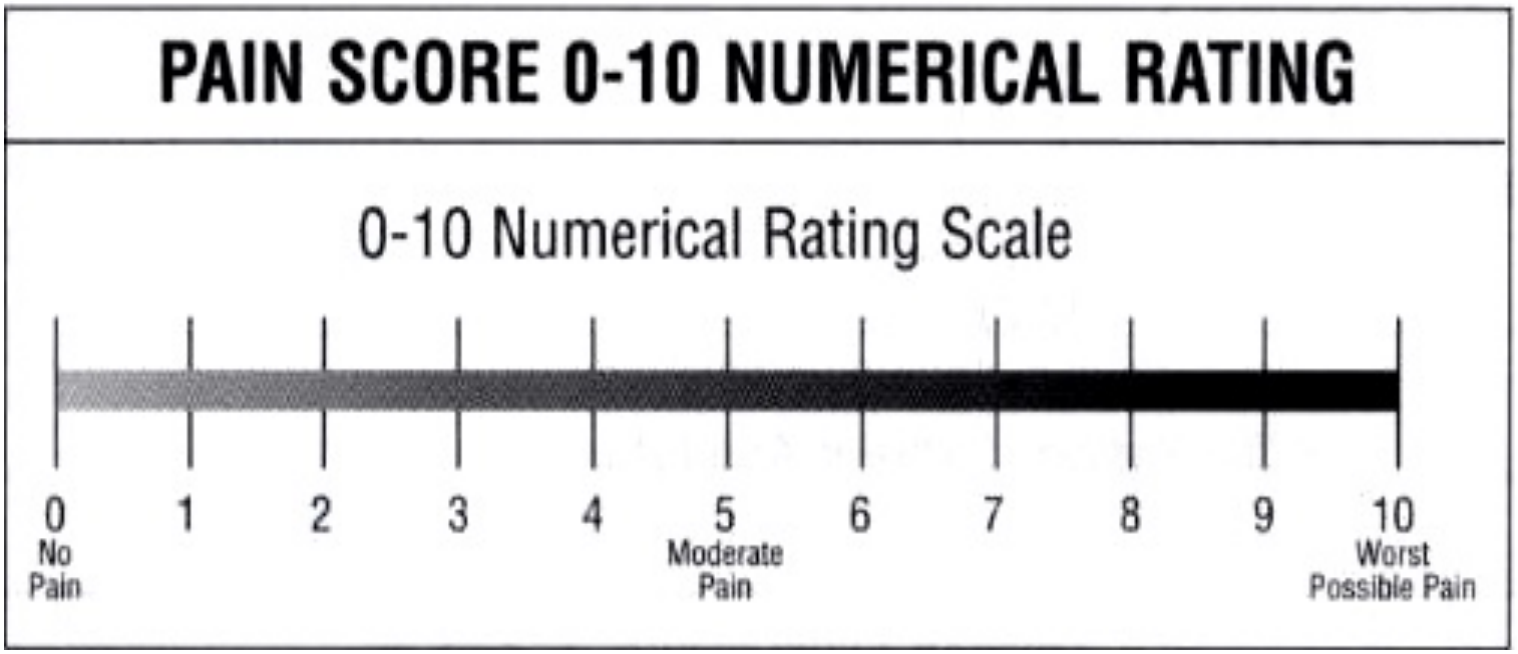
In the past, the Visual Analogue Scale has been commonly used in medical outcome studies. It is a pain scale that is easily understood by patients, but individuals have stated they are unsure of how to judge and express their pain based off of a number (Kersten et al, 2012). The scale can be displayed vertically or horizontally. It is typically a 100mm scale to reduce the risk of errors. The zero represents no pain and the 100 indicated the worst possible pain one has ever experienced. To rate the pain, the patient will mark the scale according to the pain he or she is experiencing. A ruler is used to measure the scale in centimeters to determine the severity of pain the patient is experiencing. On the 100mm scale, 0-4mm is considered no pain, 5-44mm is considered mild pain, 45-74mm is considered moderate pain, and 75-100mm is considered severe pain (French, Hawker, Kendzerska, & Mian, 2011).



[Untitled image of VAS scale]. Retrieved April 6, 2015 from http://www.jocmr.org/index.php/JOCMR/article/view/1160/578.

Appendix E

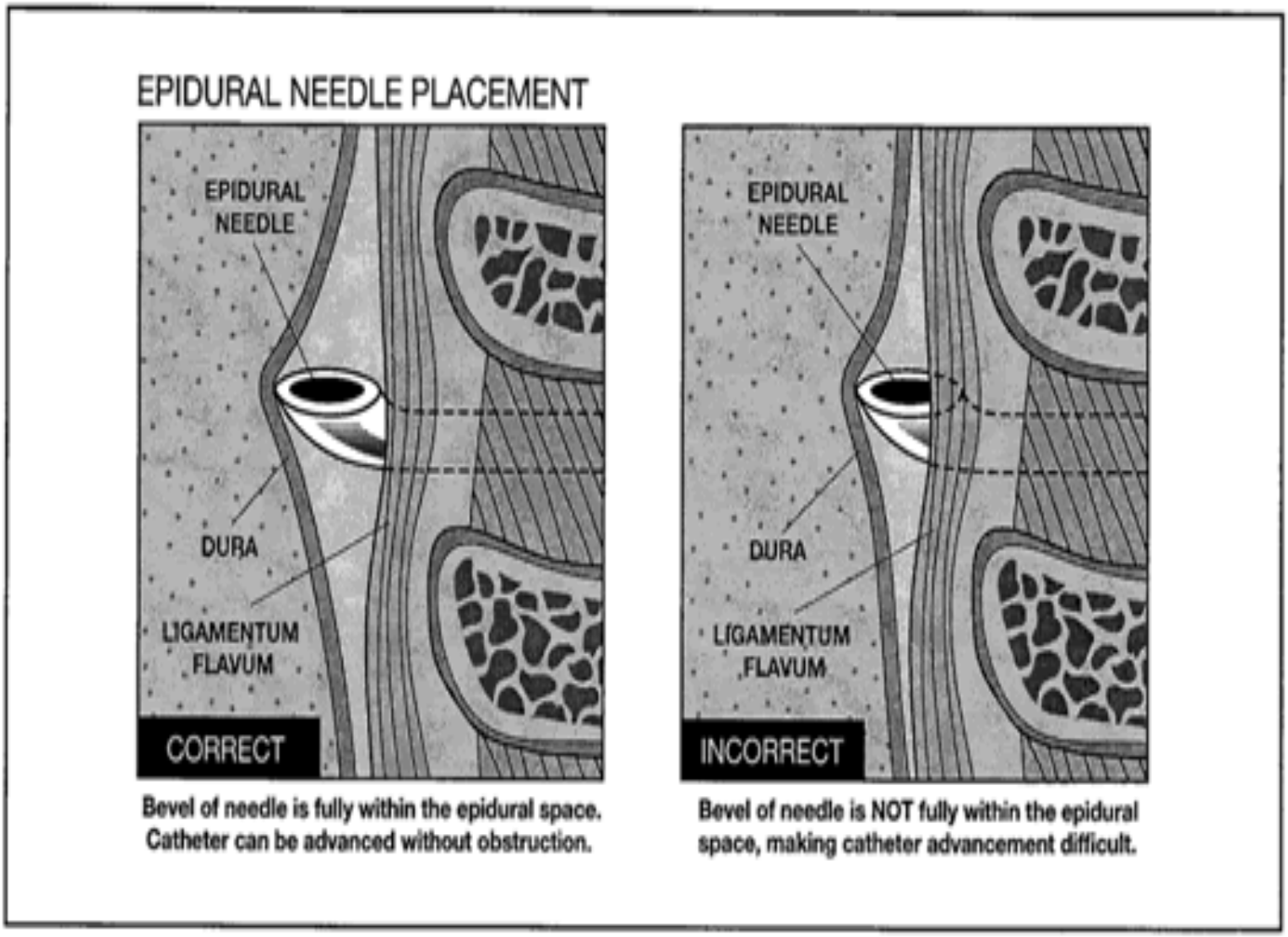
The Numeric Rating Scale for pain is an abbreviated version of the Visual Analogue Scale. The patient rates his or her pain on a scale of zero to ten, where zero is no pain and ten is severe. This pain scale is only displayed horizontally. Since the pain scale is a segment of the VAS, it can be administered verbally or on paper. The use of this scale allows health care professionals to quickly assess a patient's pain level (French, Hawker, Kendzerska, & Mian, 2011).



[Untitled image of the Numerical Pain Scale]. Retrieved April 6, 2015 from http://www.nature.com/nrrheum/journal/v3/n11/images/ncprheum0646-i2.jpg.

Appendix F

The four main factors to administering an epidural include: preparation, position, projection, and puncture. The patient must be informed about epidural placement along with the risk and benefits. The patient must be prepared and knowledgeable, the proper supplies should be gathered, and preparing a sterile field is necessary. The patient can decide between a lateral decubitus, sitting, or prone position for catheter insertion. Lateral decubitus position is when the patient lying on his or her side, so the back is parallel with the side of the bed. The patient's legs are flexed upward and the head is flexed towards the chest. Once the individual is in position, the midline is identified, so the anesthesiologist can easily find the epidural space. After the space is located, the needle should be advanced 1-2mm further. This is done to prevent any tissue from covering the needle (Epidural Technique, n.d.).



[Untitled image of the Epidural Needle Placement]. Retrieved April 6, 2015 from http://www.arrowintl.com/images/epidural_placement.gif.

Appendix G

The images below display a standard patient controlled analgesia pump. Attached to the pump is a button the patient can press when he or she desires medication. The pump will sound when the analgesic is administered. The pump is set to administer a programmed amount throughout each hour. Lockouts are set in place to keep patients safe and to receive the prescribed amount of medication. The pain medication is kept locked along with the pump, so the settings are unchanged.

[Untitled image of a patient and PCA pump]. Retrieved April 6, 2015 from http://www.mskcc.org/sites/www.mskcc.org/files/imagecache/medium/node/%5B nid%5D/images/PCA1.PNG.

[Untitled image of a PCA pump]. Retrieved April 6, 2015 from http://upload.wikimedia.org/wikipedia/commons/5/57/PCA-02.JPG.

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