Chapter 17. Improving the Quality of Care Through Pain Assessment and Management

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Background

At some point in life, virtually everyone experiences some type of pain. Pain is often classified as acute or chronic. Acute pain, such as postoperative pain, subsides as healing takes place. Chronic pain is persistent and is subdivided into cancer-related pain and nonmalignant pain, such as arthritis, low-back pain, and peripheral neuropathy. These authors will draw from the body of knowledge related to chronic pain; however, this chapter will focus on the evidence supporting management of acute pain experienced by hospitalized adults.

Scope of the Problem

Almost 35 million patients were discharged from U.S. hospitals in 2004; of these patients, 46 percent had a surgical procedure and 16 percent had one or more diagnostic procedures.[1] Pain is common, and expected, after surgery. Recent data suggest 80 percent of patients experience pain postoperatively[2] with between 11 and 20 percent experiencing severe pain.[2, 3] Despite the availability of analgesics—particularly opioids—and national guidelines to manage pain, the incidence of postoperative pain has remained stable over the past decade.[4] Thus, acute pain associated with surgical and diagnostic procedures is a common occurrence in U.S. hospitals and remains inadequately managed for many patients.

Importance of Controlling Pain

Inadequately managed pain can lead to adverse physical and psychological patient outcomes for individual patients and their families. Continuous, unrelieved pain activates the pituitary-adrenal axis, which can suppress the immune system and result in postsurgical infection and poor wound healing. Sympathetic activation can have negative effects on the cardiovascular, gastrointestinal, and renal systems, predisposing patients to adverse events such as cardiac ischemia and ileus. Of particular importance to nursing care, unrelieved pain reduces patient mobility, resulting in complications such as deep vein thrombosis, pulmonary embolus, and pneumonia. Postsurgical complications related to inadequate pain management negatively affect the patient's welfare and the hospital performance because of extended lengths of stay and readmissions, both of which increase the cost of care.

Continuous, unrelieved pain also affects the psychological state of the patient and family members. Common psychological responses to pain include anxiety and depression. The inability to escape from pain may create a sense of helplessness and even hopelessness, which may predispose the patient to a more chronic depression. Patients who have experienced inadequate pain management may be reluctant to seek medical care for other health problems. (For more detail, go to the section, "Harmful Effects of Unrelieved Pain," below.)

Poorly managing pain may put clinicians at risk for legal action. Current standards for pain management, such as the national standards outlined by the Joint Commission (formerly known as the Joint Commission on Accreditation of Healthcare Organizations, JCAHO),[5] require that pain is promptly addressed and managed. Having standards of care in place increases the risk of legal action against clinicians and institutions for poor pain management,[6] and there are instances of law suits filed for poor pain management by physicians.[7] Nurses, as part of the collaborative team responsible for managing pain during hospitalization, also may be liable for legal action.

Hospitals stand to lose reputation as well as profit if pain is poorly managed. Patient satisfaction with care is strongly tied to their experiences with pain during hospitalization. Evidence indicates that higher levels of pain and depression are linked to poor satisfaction with care in ambulatory settings.[8] With the advent of transparent health care, report cards for hospitals are becoming more prevalent, and performance on pain management is likely to be one of the indicators reported.

Undertreatment of Pain

The undertreatment of pain was first documented in a landmark study by Marks and Sachar in 1973.[9] These researchers found that 73 percent of hospitalized medical patients had moderate to severe pain. The undertreatment of pain continues. Thirty years later in 2003, Apfelbaum and others[2] found that 80 percent of surgical patients experienced acute pain after surgery, and 86 percent of those had moderate to extreme pain. Of 1,308 outpatients with metastatic cancer from 54 cancer treatment centers, 67 percent reported pain.[10] Of those who had pain, 62 percent had pain severe enough to impair their ability to function, and 42 percent were not given adequate analgesic therapy. It is estimated that 45 percent to 80 percent of elderly patients in nursing homes have substantial pain that is undertreated.[11] These studies and others suggested that when patients had moderate to severe pain, they had only about a 50 percent chance of obtaining adequate pain relief.[12]

Harmful Effects of Unrelieved Pain

Patients suffer from pain in many ways. Pain robs patients of their lives. Patients may become depressed or anxious and want to end their lives. Patients are sometimes unable to do many of the things they did without pain, and this state of living in pain affects their relationships with others and sometimes their ability to maintain employment.

What is often overlooked is that pain has physically harmful effects. It is often actually physiologically unsafe to have pain.[13] The effects of pain on the endocrine and metabolic system, cardiovascular system, gastrointestinal system, and immune system—and the potential for future pain—are but a few of examples of how unsafe unrelieved pain may be.[13]

Pain causes stress. The endocrine system reacts by releasing an excessive amount of hormones, ultimately resulting in carbohydrate, protein, and fat catabolism (destruction); poor glucose use; and other harmful effects. This reaction combined with inflammatory processes can produce weight loss, tachycardia, increased respiratory rate, fever, shock, and death.[14] Unrelieved pain prolongs the stress response, adversely affecting the patient's recovery.[13]

The cardiovascular system responds to stress of pain by activating the sympathetic nervous system, which produces a variety of unwanted effects. In the postoperative period, these include hypercoagulation and increased heart rate, blood pressure, cardiac work load, and oxygen

demand. Aggressive pain control is required to reduce these effects and prevent thromboembolic complications. Cardiac morbidity is the primary cause of death after anesthesia and surgery.[13, 15]

Since the stress response causes an increase in sympathetic nervous system activity, intestinal secretions and smooth muscle sphincter tone increase, and gastric emptying and intestinal motility decrease. This response can cause temporary impairment of gastrointestinal function and increase the risk of ileus.[13, 15]

Unrelieved pain may be especially harmful for patients with metastatic cancers. Stress and pain can suppress immune functions, including the natural killer (NK) cells that play a role in preventing tumor growth and controlling metastasis.[13, 16] Further, management of perioperative pain is probably a critical factor in preventing surgery-induced decrease in resistance against metastasis.[17]

Unrelieved acute pain can result in chronic pain at a later date. Thus, pain now can cause pain later. If acute shingles pain is not treated aggressively, it is believed to increase the risk of postherpetic neuralgia.[18, 19] A survey of patients having undergone surgery found a high prevalence of chronic postsurgical pain in patients whose acute postsurgical pain was inadequately managed.[20]

Assessment of Pain

Assessment of pain is a critical step to providing good pain management. In a sample of physicians and nurses, Anderson and colleagues[21] found lack of pain assessment was one of the most problematic barriers to achieving good pain control. There are many recommendations and guidelines for what constitutes an adequate pain assessment; however, many recommendations seem impractical in acute care practice. Nurses working with hospitalized patients with acute pain must select the appropriate elements of assessment for the current clinical situation. The most critical aspect of pain assessment is that it is done on a regular basis (e.g., once a shift, every 2 hours) using a standard format.[5] The assessment parameters should be explicitly directed by hospital or unit policies and procedures.[5, 22, 23] To meet the patients' needs, pain should be reassessed after each intervention to evaluate the effect and determine whether modification is needed. The time frame for reassessment also should be directed by hospital or unit policies and procedures.[5]

An early *Clinical Practice Guideline on Acute Pain Management* released by the Agency for Health Care Policy and Research addressed assessment and management of acute pain.[22] This guideline outlines a comprehensive pain evaluation that would be most useful when obtained prior to the surgical procedure. In the pain history, the nurse identifies the patient's attitudes, beliefs, level of knowledge, and previous experiences with pain. Expectations of patient and family members for pain control postsurgically will uncover unrealistic expectations that can be addressed before surgery. This comprehensive pain history lays the foundation for the plan for pain management following surgery, which is completed collaboratively by the clinicians (physician and nurse), the patient, and his or her family.

Pain History

The pain history should include the following:

- Significant previous and/or ongoing instances of pain and its effect on the patient

- Previously used methods for pain control that the patient has found either helpful or unhelpful
- The patient's attitude toward and use of opioids, anxiolytics, or other medications, including any history of substance abuse
- The patient's typical coping response for stress or pain, including the presence or absence of psychiatric disorders such as depression, anxiety, or psychosis
- Family expectations and beliefs concerning pain, stress, and postoperative course
- Ways the patient describes or shows pain
- The patient's knowledge of, expectations about, and preferences for pain management methods and for receiving information about pain management[22] (p. 7–8)

Pain Assessment Tools

During the postsurgical period, pain assessment must be brief and simple to complete.[22] Because choice of intervention, including type of analgesic and dosing, is made based upon intensity, every pain assessment should include this type of measure. Numerous pain intensity measures have been developed and validated. Several tools provide a numeric rating of pain intensity (e.g., visual analogue scale, numeric rating scale (NRS)). Simpler tools such as the verbal rating scale, which classifies pain as mild, moderate or severe, also are commonly used. For patients with limited cognitive ability, scales with drawings or pictures are available (e.g., the Wong-Baker FACES scale). Patients with advanced dementia require behavioral observation to determine the presence of pain; tools such as the PAIN-AD are available for this patient population. (For more detail, go to section “Tools to Assess Pain Intensity in Cognitively Intact and Impaired Adults,” below.)

The Joint Commission developed pain standards for assessment and treatment based upon the recommendations in the *Acute Pain Clinical Practice Guideline.* The Joint Commission requires that hospitals select and use the same pain assessment tools across all departments. This standard suggests providing options among scales such as the NRS, the Wong-Baker FACES scale, and a verbal descriptor scale.

Selecting the pain assessment tool should be a collaborative decision between patient and health care provider. When this is done during the preoperative period, it ensures the patient is familiar with the scale. If the nurse selects the tool, he or she should consider the age of the patient; his or her physical, emotional, and cognitive status; and preference.[22] We tend to think of these intensity scales as verbal, but patients who are alert but unable to talk (e.g., intubated, aphasic) may be able to point to a number or a face to report their pain. The pain tool selected should be used on a regular basis to assess pain and the effect of interventions. It should not, however, be used as the sole measure of pain perception.[24]

Location and quality of pain are additional assessment elements useful in selecting interventions to manage pain. Since patients may experience pain in areas other than the surgical site, location of pain using a body drawing or verbal report provides useful information. The pain experienced may be chronic (e.g., headache, low-back pain) or it may be related to the positioning and padding used during the procedure. The quality of pain varies depending upon the underlying etiology. Instruments such as the McGill Pain Questionnaire[25, 26] contain a variety of verbal descriptors that help to distinguish between musculoskeletal and nerve-related pain. Typically, patients describe deep tissue pain as dull, aching, and cramping, while nerve-related pain tends to be more sporadic, shooting, or burning.[27, 28]

Pain interferes with many daily activities, and one of the goals of acute pain management is to reduce the affect of pain on patient function and quality of life.[24] The ability to resume activity, maintain a positive affect or mood, and sleep are relevant functions for patients following surgery. The Brief Pain Inventory[10, 29] includes four items that may be useful in assessing this aspect of the pain experience. Using an NRS format, assessment of interference with ability to walk, general activity, mood, and sleep during the recovery period will assist in selecting interventions to enhance function and quality of life.

The final elements of pain perceptions involve determining current aggravating and alleviating factors.[22, 24] Aggravating factors may be as simple as patient position, a full bladder, or temperature of the room. Alleviating factors include the interventions used (e.g., analgesics) and cognitive strategies used to control pain. Examples of such strategies are distraction, positive self-talk, and pleasant imagery. The pain history will provide insight into the coping strategies previously used by the patient and their effectiveness with previous painful episodes.

In addition to self-reported pain perceptions, a comprehensive assessment of pain following surgery includes both physiological responses and behavioral responses to pain[22] (p. 11). Physiological responses of sympathetic activation (tachycardia, increased respiratory rate, and hypertension) may indicate pain is present. Behaviors that may indicate pain include splinting, grimacing, moaning or grunting, distorted posture, and reluctance to move. While these nonverbal methods of assessment provide useful information, self-report of pain is the most accurate. A lack of physiological responses or an absence of behaviors indicating pain may not mean the patient is not experiencing pain. (Go to section “Tools to Assess Pain Intensity in the Cognitively Impaired,” below, for more detail.)

Adequate pain management requires an interdisciplinary approach.[22, 24] Documentation of pain assessment and the effect of interventions are essential to allow communication among clinicians about the current status of the patient’s pain and responses to the plan of care. The Joint Commission requires documentation of pain to facilitate reassessment and followup. The American Pain Society suggests that pain be the fifth vital sign as a means of prompting nurses to reassess and document pain whenever vital signs are obtained.[30] Documentation also is important as a means of monitoring the quality of pain management within the institution.

Monitoring the Quality of Pain Management

Establishing and maintaining an institutional pain performance improvement plan is a Joint Commission requirement.[5] Institutions should develop interdisciplinary approaches to acute pain management with clear lines of responsibility for achieving good acute pain control.[5, 22, 24] This interdisciplinary approach includes an individualized plan of care for pain control, developed in collaboration with the patient and family. Systems should be in place to monitor pain management that alerts the clinician when pain is poorly managed. For example, in an institution with a computerized documentation system, an alert may pop up when a patient’s pain exceeds a threshold. The threshold may be set individually by patient and clinician or institutionally. A reasonable threshold might be moderate to severe pain, which means a pain score of greater than 4 on a 0–10 scale.[31] The plan of care provides the basis for monitoring the quality of acute pain management provided.

American Pain Society Current Guidelines

One of the first quality improvement programs was developed by the American Pain Society.[23] The quality improvement guideline was refined and expanded in 2005[24] (p. 1576) based upon a systematic review of pain quality improvement studies conducted over the past 10 years.[32] The emphasis has shifted from processes to outcomes.

- Recognize and treat pain promptly.
- Involve patients and families in pain management plan.
- Improve treatment patterns.
- Reassess and adjust pain management plan as needed.
- Monitor processes and outcomes of pain management.

The goal of pain management after surgery is to prevent and control pain. Postsurgical pain, like cancer pain, is expected to be present continuously with spikes of increased pain with movement, deep breathing and coughing, and ambulation during the fist 24–48 hours after surgery. Around-the-clock dosing is recommended during this early postsurgical period to prevent severe pain and control continuous pain.

Quality Indicators[24] (p. 1578)

Quality indicators for pain management focus on appropriate use of analgesics and outcomes.

- Intensity of pain is documented using a numeric (0–10) or descriptive (mild, moderate, severe) rating scale.
- Pain intensity is documented at frequent intervals.
- Pain is treated by route other than intramuscular.
- Pain is treated with regularly administered analgesics, and, when possible, multimodal approach is used. (Multimodal approach includes a combination of pain control strategies, such as opioids, nonsteroidal anti-inflammatory drugs, nonpharmacological interventions.)
- Pain is prevented and controlled to a degree that facilitates function and quality of life.
- Patients are adequately informed and knowledgeable about pain management.

To efficiently monitor quality indicators, patient records should contain documentation of

- Pain intensity (0–10 or mild, moderate, severe)
- Analgesics prescribed and administered, including drug, route, and dosing
- Impact of pain on function and quality of life (e.g., ability to walk, general activity, mood, sleep)
- Pain education for patient and family member(s)

Patient Satisfaction

Although satisfaction with pain management currently is used as a measure of institutional quality, satisfaction with pain management is no longer recommended as a quality indicator for pain control.[24, 32] This is because patient satisfaction findings are difficult to interpret. In their review of 20 quality improvement studies conducted between 1992 and 2001, Gordon and colleagues[32] noted 15 studies reported high satisfaction with pain management despite many

patients experiencing moderate to severe pain during hospitalization. Thus, patient satisfaction data should be cautiously interpreted and, if used, used in conjunction with other quality indicators. Because of the current focus on report cards for health care organizations, patient satisfaction data are routinely collected and easily obtained for review.

Many institutions use commercial patient satisfaction surveys to monitor satisfaction with care. Most of these surveys have at least one item on satisfaction with pain management. Institutions also may use generic health status or quality of life surveys, such as the Medical Outcomes Study Short From-36, to monitor patient outcomes; most of these surveys include one or more questions on pain experienced. Regular review of these patient satisfaction data can be used as a quick measure of quality of pain care. If satisfaction scores on pain management dip, a more thorough investigation of pain management processes is warranted.

Use of an interdisciplinary team to monitor current pain practice, identify areas for improvement, and oversee quality improvement plans is consistently recommended in the guidelines.[5, 22, 24] To effectively monitor pain practice within a hospital, electronic systems are needed to capture and collate data on the indicators in a readily available form. One method of changing clinician behavior is through the use of feedback on performance; thus the reports generated for interdisciplinary committee review also may be used to assist clinicians to review and adjust their performance.

Current Guidelines

Many State and professional organizations have developed clinical practice guidelines to direct health care providers in adequate management of acute pain. The 1992 *Acute Pain Clinical Practice Guideline*[22] lays the foundation for the more current guidelines. Listed below is a sample of current guidelines available from the National Guideline Clearing House.

- Pain management guideline; developed by the Health Care Association of New Jersey; released July 2006. This guideline includes definitions of pain (acute and chronic); clear direction for assessment and treatment with pharmacological and nonpharmacological interventions (including physical and occupational therapy); policies for pain education for staff, patients, and families; and direction for quality monitoring. The guideline is applicable to pain management in acute care and long-term care nursing facilities. Web site: http://www.guidelines.gov/summary/summary.aspx?doc_id=5526&nbr=003757&string=pain+and+assessment+and+nursing
- "Pain Management"; written for the 2nd edition of *Geriatric Nursing Protocols for Best Practice*; published in 2003. This guideline addresses pain in the elderly, assessment strategies, and nursing interventions to control pain. Pharmacological and nonpharmacological interventions are included in the guideline. Web site: http://www.guidelines.gov/summary/summary.aspx?doc_id=3514&nbr=002740&string=pain+and+assessment+and+nursing
- *ASPAN Pain and Comfort Clinical Guideline*; developed by American Society of Perianesthesia Nurses; released August 2003. This guideline provides direction for assessment, interventions, and expected outcomes for the preoperative and postoperative phases of treatment. Use of pharmacological and nonpharmacological interventions is endorsed. Web site: http://www.guidelines.gov/summary/summary.aspx?doc_id=5526&nbr=003757&string=pain+and+assessment+and+nursing

- *Clinical Practice Guideline for the Management of Postoperative Pain*; developed by the Veterans Health Administration; released May 2002. This guideline is organized into two main algorithms, one for the preoperative phase and the other for the postoperative phase. The pain management plan is set within the context of comprehensive pre- and postsurgical care and includes discharge planning. A patient-focused objective is provided for each step of the pain management plan. Emphasis is placed upon reassessment and modification of the treatment plan. Clear descriptions of common opioid side effects and interventions to reduce them are included in the guideline. Web site: http://www.guidelines.gov/summary/summary.aspx?doc_id=3284&nbr=002510&string=pain+and+assessment+and+nursing
- The American Society of Pain Management Nursing has published two position statements on pain management issues that pose difficulty ethically and in practice. Practice recommendations based upon research and clinical expertise are included in both position statements.
  - Herr et al. Pain assessment in the nonverbal patient: Position statement with clinical practice recommendations. *Pain Management Nursing* 2006;7(2):44-52.
  - American Society for Pain Management Nursing. ASPMN position statement: pain management in patients with addictive disease. *Journal of Vascular Nursing* 2004;17(3):99-101.
- With the implementation of the Joint Commission standards for pain management, the requirements for "as needed" (PRN) orders were altered. The American Society of Pain Management Nursing and the American Pain Society developed a consensus statement on the use of PRN range orders to guide nursing practice.
  - Gordon et al. Use of "as needed" range orders for opioid analgesics in the management of acute pain. *Home Healthcare Nurse*, 2005;23(6):388-96.

Research Evidence

Analgesics, particularly opioids, are the primary treatment for acute pain. It is estimated that up to 90 percent of cancer pain can be adequately managed with analgesics using the World Health Organization (WHO) analgesic ladder.[33, 34] Although no evidence exists to estimate the likelihood of adequately managing acute pain, it is reasonable to infer that the vast majority of postsurgical pain can be well managed with the appropriate use of analgesics. While there are many factors that contribute to poor pain management—lack of assessment and inadequate or inapposite use of analgesics are primary, and modifiable, factors.[35] Thus, it is the responsibility of clinicians to be knowledgeable about the analgesics used to treat pain, including onset, peak action, and duration of the drug(s) administered; common side effects, and methods of managing those side effects.[36] Easy access to an equianalgesic table assists in providing good pain control when switching from one opioid to another and from one route to another. This approach is particularly important when preparing the postsurgical patient for discharge with an oral analgesic.

The objective for postsurgical and procedural pain is to prevent and control pain.[22, 24] This does not mean that patients will be pain free, a misconception that some patients and families have when entering the hospital. This misconception is best addressed during the preoperative pain assessment by collaboratively setting goals for pain control and function. A multimodal approach (balanced analgesia), which includes opioids, nonopioids such as nonsteroidal anti-

inflammatory drugs (NSAIDs), and adjuvant medications such as anticonvulsants, is recommended. (For more detail go to the "Balanced Analgesia" section in this chapter.) Following the WHO's analgesic ladder for control of cancer pain, the Clinical Practice Guideline Committee recommended the use of NSAIDs for mild to moderate pain with the addition of opioids for moderate to severe pain.[22]

Principle of Analgesic Management of Pain

Based upon evidence and clinical practice, there are several principles of analgesic management to meet the objective of preventing moderate to severe pain:

- When continuous pain is anticipated, a fixed-dose schedule (around the clock) should be used.
- A PRN order of a rapid onset analgesic may be necessary to control activity-related (breakthrough) pain.
- To ensure opioids are safely administered, begin with a low dose and titrate to comfort.
- Modification in analgesic administration is based upon assessment of the effect of the previous dose, including change in pain intensity, relief, and side effects experienced.
- Patients respond differently to various opioid and nonopioid analgesics; therefore if one drug is not providing adequate pain relief, another in the same class may result in better pain control.
- Assessment of effect should be based upon the onset of action of the drug administered; for example, IV opioids are reassessed in 15–30 minutes, whereas oral opioids and nonopioids are reassessed 45–60 minutes after administration.

Opioid Analgesics

A series of three systematic reviews have been published in the past 5 years examining the efficacy, safety, and side effect profile of opioids used to manage postsurgical pain.[2, 37, 38] The first review[3] concluded that patient-controlled analgesia (PCA) and epidural routes of administration were superior to intramuscular (IM) injections when pain intensity and relief were considered. The safety of opioids used to control postsurgical pain was examined for hypotension and respiratory depression; observed rates were less than 5 percent for hypotension and less than 1 percent for respiratory depression.[37] The most common opioid side effects included 25 percent nausea, 20 percent vomiting, 23.9 percent mild sedation, 2.6 percent excessive sedation, 14.7 percent pruritis, and 23 percent urinary retention. The use of intravenous PCA was associated with the highest levels of nausea and sedation, whereas epidural analgesia was associated with the highest rate of urinary retention.[38] This series of systematic reviews suggests the IM route of administration produces the poorest outcomes. Approximately one in every four patients will experience common opioid side effects; however, the rate of excessive sedation, respiratory depression, and hypotension related to opioids are low in the postsurgical population.

Patient and Family Education

Beginning with the *Acute Pain Clinical Practice Guideline*,[22] patient and family education has been a central recommendation for acute pain management. This education is best

implemented during the presurgical clinic visit or during admission pain assessment. The essential elements of pain education include telling the patient the following:

- Preventing and controlling pain is important to your care.
- There are many interventions available to manage pain; analgesics (opioid and nonopioid) are the most effective in managing acute pain.
- Some people are afraid of using opioids because of the side effects and risk of addiction. Side effects can be managed effectively with medication. The risk of addiction when using opioids to control acute pain is extremely low.
- Your responsibility in achieving good pain control is to tell us when you are experiencing pain or when the nature or level of pain changes.
- Complete pain relief usually is not achievable; however, we will work with you to keep pain at a level that allows you to engage in activities necessary to recover and return home.

This last comment flows directly into a discussion about goals for pain management during the hospitalization. This goal is set in light of the functional requirements (e.g., when ambulation will begin, need for deep breathing) to promote recovery. Thus, the patient, family member(s), and nurse collaboratively set a tolerable or satisfactory level of pain and function during the hospitalization, which is documented either in the patient's room or record so that all clinicians are working toward the same goals for pain control. Shared goal setting is one dimension of relational coordination associated with adequate postsurgical pain management.[39] Information obtained from the pain history (e.g., previous experience with pain and what helped or did not help, typical coping strategies used) will assist in developing a plan of care that incorporates the patient's preferences into the plan.

Patient-Nurse Interactions

One of the earliest evidence-based protocols was developed as part of the Conduct and Utilization of Research in Nursing (CURN) project. *Pain: Deliberative Nursing Interventions*[40] describes an approach to a patient's complaint of pain that includes skilled communication to determine the patient's needs. While administering analgesics may be the most appropriate way to meet the patient's needs, the nurse may uncover other factors contributing to discomfort, such as uncomfortable position, thirst, or the need to urinate.[40] Addressing these needs will improve patient comfort and communicate the nurse's desire to promote comfort. McCaffery[35] suggested that the time spent with the patient to communicate concern and caring may go a long way in providing patient comfort. The content of this 5-minute conversation may include the following:

- Listening to patient concerns
- Communicating the desire to help the patient become more comfortable
- Determining strategies that might achieve more comfort[35] (p. 78)

Communication with patients is one of the core dimensions of relational coordination, an approach examined in the orthopedic surgical population.[39] In a cross-sectional study of nine hospitals, Gittell and colleagues[39] found that the better the relational coordination, the better the postsurgical pain relief. Of note, four dimensions (frequent communication, shared goals, shared knowledge, and mutual respect among clinicians) were associated with this improvement in pain control. Thus, this study suggested that communication, goal setting, and patient education contributed to better pain outcome.

Nondrug Techniques To Manage Pain

People naturally use many nondrug strategies, such as distraction, imagery, and massage, to alleviate pain. During episodes of acute pain, patients may rely on these previously used and "proven" methods. For example, Kwekkeboom[41] found women recovering from breast and gynecological surgery used a variety of nondrug techniques in addition to analgesics to relieve pain at home. Although the techniques varied, methods to increase relaxation were common (e.g., breathing, meditation, imagery, and music). Hospitalized patients also may use techniques that have worked for them in the past; in a study of nondrug techniques to manage postsurgical pain, Pellino and colleagues[42] reported that between 19 and 28 percent of patients in the usual care control group used nondrug techniques during the first 3 days after surgery. Thus, patients in pain may spontaneously (i.e., without instruction or help) use a wide variety of nondrug methods to control their pain. Before suggesting or instructing patients in the use of nondrug techniques, nurses need to be aware of the methods used effectively and preferred by the patient. For example, in a trial of five cognitive-behavioral techniques to manage cancer pain in ambulatory patients, Anderson and colleagues[43] noted that a number of patients had difficulty using their assigned technique because it did not match their usual coping style. In addition to applying the wrong technique, instructing patients in the use of a specific technique, such as imagery, may undermine their confidence in the techniques they typically use to control pain.

Nurses have used nondrug techniques for years to help patients manage pain. These techniques have been labeled differently over the years. Noninvasive, nonpharmacological, nondrug, and complementary therapies have been used interchangeably to reflect nonmedical therapies. McCaffery[35] noted that there is no classification system for these nondrug techniques. For the purposes of this chapter, techniques will be grouped as cognitive and physical. Cognitive techniques focus primarily on mental functions that require some degree of attention. Distraction or focusing attention away from the pain may be one of the primary mechanisms resulting in pain relief. Relaxation and music are included in this cognitive category. Physical techniques focus on altering physiological processes that may reduce pain. Massage and the application of heat and cold are included in this category. One possible mechanism of action for massage and heat/cold therapy is the stimulation of the large diameter fibers, which are hypothesized to reduce central pain transmission. Reducing muscle tension, which may contribute to pain transmission, is another possible mechanism of action.

Relaxation. There are many methods available to achieve a relaxation response. Some require initial training and practice to be used effectively; progressive muscle relaxation, systematic relaxation, and autogenic training are skills that require some practice. Each session using progressive, systematic, or autogenic training may take 15–30 minutes. Typically in research, the instructions are delivered via audiotape, a method that may be used for hospitalized patients as well. Simpler forms of relaxation, which may be more suitable to institute during an acute pain episode, include jaw dropping and rhythmic breathing.

Reviews on the effectiveness of relaxation for pain relief have arrived at different and often opposite conclusions.[44–46] This is not surprising because of the wide variety of techniques that were used as well as the small number of studies published (11 to 12 in the most recent reviews). The recent randomized clinical trials also contribute to this inconsistency.[43, 47, 48] Therefore, the current evidence does not support a consistent, predictable effect of relaxation on pain.

Music. Sedating or soothing music is instrumental, rhythmic, and 60–80 beats per minute. In much of the research, musical pieces are selected from five types of music identified by Good

and colleagues:[49] synthesizer, harp, piano, orchestral, or slow jazz. The intervention is delivered via audiotape and headphones. The duration is typically 20–30 minutes and may involve a single or multiple exposures.

A recent meta-analysis of 51 studies examining the effect of music on pain concluded that although music produced a significant reduction in pain intensity (0.5 units), this result may not reflect a clinically important change.[50] Gordon and colleagues[24] suggest a 1.5 to 2.0 unit change in pain intensity on a 0–10 scale constitutes a clinically important difference. Despite the large number of studies included, approximately 50 percent were of low quality, leading to low confidence in the results of the analysis. Contrary to previous meta-analyses,[51] Cepeda and colleagues[50] did not find differences in pain reduction related to whether the music was patient- or clinician-selected. Recently published studies, all conducted on patients undergoing cardiovascular procedures, found significant short-term reductions in pain, distress, or anxiety after exposure to music.[52–54] In each of these studies, music was used during an episode of increased pain (e.g., getting up from a chair). While these studies hold promise, currently the evidence for the effectiveness of music in reducing acute pain is weak to moderate.

Massage. Massage is defined as the systematic manipulation of soft tissues by manual or mechanical means.[55] Nurses have used massage—a back rub—to improve circulation, promote comfort, and enhance sleep. More recently investigators have examined hand and foot massage as an alternative to back or body massage. The duration of massage varies from 5 to 20 minutes. Wong and Keck[56] suggested that 20 minutes of massage was required to achieve the desired effect, but little evidence exists to substantiate this claim.

Reviews of the massage literature conclude it has a beneficial effect on anxiety and tension, depression, and stress hormones (cortisol and catecholamines).[57, 58] The evidence on the beneficial effects of massage on reducing pain is positive, but involves few studies, so that firm conclusions cannot be drawn. More recent studies produced inconsistent findings, particularly in terms of the effect of massage on pain control.[56, 59–62] As with the relaxation and music literature, studies of the effect of massage suffer from methodological problems[57] that produce unstable or biased results.

Heat/cold therapy. The application of heat and ice to reduce pain or promote comfort has been a common nursing intervention, which may require a physician's order to implement.

Despite the use of heat and cold by nurses, there are few studies investigating the impact on pain or function. A meta-analysis of heat and cold for low-back pain concluded that continued use of heat (over a 5 day period) improved pain intensity and function.[63] Only two studies on the use of heat for postsurgical pain were found, and the findings from these were inconclusive.[64] The application of ice/cold for low-back pain has limited evidence to support it's use.[63] Cold therapy has been investigated in patients undergoing orthopedic surgeries (primarily total knee arthroplasty) and has been found to improve pain, range of motion, and function.[65] However, a study by Smith and others[66] found that pain was similar with the cryo pad (a new technology to deliver cold therapy) and the compression bandage applied by the surgeon at the end of surgery; in addition, the cold therapy increased the cost of care and took more nursing time. Thus, using cold therapy via the cyro pad provides no benefit over compression bandages after knee replacement and is less cost efficient.

Use of multiple nondrug therapies for pain management. Introduction to a variety of nondrug techniques may be used to better meet patients' needs. Two recent studies examined the effect of providing multiple nondrug techniques (e.g., a cafeteria style) on postsurgical pain. In both studies, the interventions were developed to allow the patient maximum control and require

minimum nursing time. Common techniques used in both studies included relaxation, music, and massage.[42, 67] While it is too early to determine if providing a pain "tool kit" will have benefit to postsurgical patients, Kshettry and colleagues[67] demonstrated the feasibility of implementing such a program in a busy intensive care unit (ICU).

Evidence-Based Practice Implications

Lack of adequate assessment and inappropriate treatment remain the major factors of undertreatment of pain. There is ample evidence that the appropriate use of analgesics—the right drug(s) at the right intervals—can provide good pain relief for the majority of patients. Thus, institutions should place their money and effort on improving these provider behaviors (assessment, prescription and administration of analgesics).[35] The use of nondrug therapies is recommended in most pain guidelines; however, the evidence for their consistent benefit in terms of pain intensity, relief, or improved function is weak at best. This result does not mean a nondrug technique, or several techniques provided cafeteria style, may not improve a patient outcome. The nurse who uses these techniques should be aware that the effect is not predictable.[35]

Ensuring Patient Safety

Following are some patient safety issues that relate to pain management:

- When administering sedatives, consider the patient's physical safety (e.g., using bed rails, fall precautions, assistance with ambulation).
- Eliminate errors related to PCA infusions (improper dose/quantity, wrong drug, drug omission) by using systems to double-check drug and dose (e.g., bar coding, nurse-nurse checking).[68]
- Eliminate errors and complications related to catheter administration (initial dose testing, monitoring catheter and response to medication).[69]
- Nondrug techniques have minimal adverse events reported and do not pose safety issues.
- Protect skin when applying heat or cold.

Tools To Assess Pain Intensity in Cognitively Intact Adults

The first step in relieving pain to prevent its harmful effects, and doing so safely, is to assure that patients are properly assessed for pain so that appropriate pain relief measures can be implemented. Otherwise, pain may be unnoticed by clinicians or may be undertreated.

Self-report is the most reliable way to assess pain intensity. When the patient is able to report pain, the patient's behavior or vital signs should never be used in lieu of self-report. For the cognitively intact adult, assessment of pain intensity in the clinical setting is most often done by using the zero to 10 numerical rating scale or the zero to 5 Wong-Baker FACES scale.[70] The NRS consists of a straight horizontal line numbered at equal intervals from zero to 10 with anchor words of "no pain" for zero, "moderate pain" for 5, and "worst pain" for 10. The FACES scale consists of six faces showing progressive pain intensities, beginning with a smiling face and ending with a crying face.

Once the patient knows how to use a pain intensity scale, the patient should be taught how to establish a comfort-function goal. This is the pain intensity at which the patient is easily able to

perform necessary activities, such as ambulating after surgery or being able to concentrate on job-related activities. Interventions are implemented to achieve and maintain this pain rating as much of the time as possible.[70]

Tools To Assess Pain Intensity in Cognitively Impaired Adults

When the patient is unable to self-report pain, other less reliable measures must be used to identify the existence of pain and estimate the probable intensity. These assessment measures form a hierarchy, arranged in order of probable importance:[70, 71]

- Conditions, such as surgery, or procedures, such as wound care, that are likely to cause pain.
- Patient behaviors that are likely to indicate pain. A behavioral assessment tool, discussed below, may be used. Whenever possible, a pain behavior scale should be chosen that has been researched for reliability and validity in the clinical setting.
- Knowledge of others who know the patient, such as the family or caregivers. They should be asked if they see behaviors that may indicate pain or if they know of preexisting conditions, such as arthritis, that cause pain.

If any of the above suggest pain is present, the clinician may assume pain is present and use the acronym APP to record assessment when a pain intensity rating cannot be obtained. Next, a conclusion is made about an appropriate intervention based on the probable intensity of pain. If appropriate, a trial dose of analgesic is given and the patient's behavior is observed before and after this intervention. If the behavior subsides, this may indicate that indeed the patient has pain and that the analgesic should be continued. If there is no change in behavior, a stronger dose of analgesic may be indicated.[71]

Behavioral assessment tools are helpful in identifying the existence of pain and evaluating interventions. These scales are of two types: (1) pain behavior scales, and (2) pain behavior checklists. Some of these scales are scored by identifying the number or intensity of behaviors. However, this score is not a pain intensity score. No research as yet confirms that a pain behavior score is a pain intensity score.[71] Therefore, it is unsafe to use pain behavior scores as pain intensity scores. A patient with only a few behaviors may have as much pain as a patient with many more behaviors.

An example of a pain behavior scale is the Behavioral Pain Scale (BPS), developed for use in the critically ill patient in the ICU.[72] It evaluates and scores three categories of behavior:

1. Facial expression, scores range from 1 for relaxed to 4 for grimacing
2. Upper-limb movement, scores range from 1 for no movement to 4 for permanently retracted
3. Ventilator compliance, scores range from 1 for tolerating ventilator to 4 for unable to control ventilation

Once again, a score above 3 may indicate pain is present and the score can be used to evaluate intervention, but cannot be interpreted to mean pain intensity. For a pain behavior scale to be useful, the patient must be able to respond in all categories of behavior. For example, the BPS would be useless in a patient who is receiving a neuromuscular blocking agent.

Behavior checklists differ from pain behavior scales in that they do not evaluate the degree of an observed behavior and do not require a patient to demonstrate all of the behaviors specified, although the patient must be responsive enough to demonstrate some of the behaviors. These

checklists are useful in identifying the patient's "pain signature," that is, the pain behaviors unique to the individual.[73]

An example of a pain behavior checklist is the Pain Assessment Checklist for Seniors with Limited Ability to Communicate (PACSLAC).[74] The PACSLAC evaluates 60 behaviors such as facial expressions, activities, and mood. A check mark is made next to any behavior the patient exhibits. The total number of behaviors may be scored, but again, this cannot be equated with a pain intensity score. It is unknown if a high score represents more pain than a low score. In other words, a patient who scores 10 out of 60 behaviors does not necessarily have less pain than a patient who scores 20.[71] However, in an individual patient, a change in the total pain score may suggest more or less pain. A more comprehensive description of pain assessment tools for the cognitively impaired are located at the following Web site in the education section of Pain in the Elderly: http://www.cityofhope.org/PRC/.

Balanced Analgesia

Analgesics are usually divided into three categories: (1) nonopioids, which include acetaminophen and NSAIDs; (2) opioids, which include morphine-like drugs; and (3) adjuvant analgesics, which include local anesthetics and anticonvulsants. Using an analgesic from each one of the three groups, referred to as balanced or multimodal analgesia, may improve the safety of analgesic therapy. When more than one analgesic is used, the same level of pain relief may be achieved with a lower dose of each analgesic. For example, use of a local anesthetic along with an opioid usually allows reduction of the opioid dose needed for adequate pain control.

Safe Use of Opioids

Of all the analgesics used in pain control, the most safety issues arise with the use of those referred to as mu opioids, or morphine-like drugs such as morphine, hydromorphone (Dilaudid™), and fentanyl. Clinicians fear causing harm with these analgesics by administering too much and causing life-threatening respiratory depression. Sometimes this fear results in undertreatment of pain. Clinicians need to be educated about the effective methods of preventing respiratory depression and appropriate use of naloxone if respiratory depression does occur.

Opioid-induced respiratory depression is preceded by an increasing level of sedation. An alert patient will not suddenly succumb to respiratory depression. Consequently, respiratory depression can be prevented by observing sedation levels and decreasing the opioid before respiratory depression occurs. Box 1 presents a sedation scale that nurses can use at regular intervals to monitor patients receiving opioids. This scale should be used for all opioid naïve patients with moderate to severe pain when opioid dosing is initiated. These patients should be monitored at least every 2 hours during the first 24 hours of opioid therapy. Using this scale, the nurse knows when it is or is not safe to administer additional opioid and when the opioid dose should be decreased or stopped.

When selecting a sedation scale for prevention of opioid-induced respiratory depression, care must be taken to be sure that the selected scale matches the intended purpose. For example, the Ramsey is appropriate for monitoring the patient's tolerance for ventilation in the ICU, but is not intended for use in prevention of opioid-induced respiratory depression. It contains irrelevant items, such as agitation, which have nothing to do with opioid-induced respiratory depression.

Nurse monitoring of sedation levels and respiratory status is more appropriate for preventing opioid-induced respiratory depression than relying on pulse oximetry or apnea monitory. These

can give a false sense of security.[75–77] Further, decreased oxygen saturation is a later sign of impending respiratory depression. Capnography may more accurately detect respiratory depression and apnea;[78] however, further research is required to recommend widespread use of the method outside of the operating room or post-anesthesia care unit. The use of mechanical monitoring is recommended if a patient has a preexisting condition that requires it, such as sleep apnea or chronic obstructive pulmonary disease.[76]

Instructions for the safe use of naloxone to reverse clinically significant opioid-induced respiratory depression are included in Box 1. Naloxone must be titrated carefully. Giving too much naloxone or giving it too fast can precipitate severe pain and increase sympathetic activity leading to hypertension, tachycardia, ventricular dysrhythmias, pulmonary edema, and cardiac arrest.[79]

The IM route of administration is not recommended for pain management.[76] It is painful, and it has unreliable absorption with a 30–60 minute lag time to peak effect and a rapid drop in action. In addition to being ineffective, the IM route is dangerous because patients are often alone at the time of peak effect of the opioid administered, can become excessively sedated, vomit, and aspirate. A better alternative is the intravenous (IV) route of administration. Points to consider in the overall safe management of opioid naïve patients receiving IV or intraspinal analgesia are in Box 2.

Box 1: Pasero - McCaffery Opioid-induced Sedation Scale

S = Sleep, easy to arouse

Acceptable: No action necessary; supplemental opioid may be given if needed.

1 = Awake and alert

Acceptable: No action necessary; supplemental opioid may be given if needed.

2 = Slightly drowsy, easily aroused

Acceptable: No action necessary; supplemental opioid may be given if needed.

3 = Frequently drowsy, arousable, drifts off to sleep during conversation

Unacceptable: Decrease opioid dose by 25–50 percent . Administer acetaminophen or an NSAID, if not contraindicated, to control pain; monitor sedation and respiratory status closely until sedation level is less than 3.

4 = Somnolent, minimal or no response to physical stimulation

Unacceptable: Stop opioid. Notify anesthesia provider; very slowly administer dilute IV naloxone (0.4 mg naloxone in 10 mL saline; 0.5 mL over 2-minute period); administer acetaminophen or an NSAID, if not contraindicated, to control pain; monitor sedation and respiratory status closely until sedation level is less than 3.

Source: Pasero C. *Acute pain service: policy and procedure guideline manual*. Los Angeles, CA: Academy Medical Systems, 1994; Pasero C, Portenoy RK, McCaffery M. Opioid analgesics, In: McCaffery M, Pasero C. *Pain: clinical manual*. 2nd ed. St. Louis, MO: Mosby; 1999. p. 161-299. Copyright Chris Pasero, 1994. Used with permission.

Box 2: Safe Care of the Opioid Naïve Patient Receiving Opioids by IV or Intraspinal Routes

- Develop standardized, preprinted order sets that include
    - Opioid prescription
    - Administration of nonopioid analgesia, e.g., acetaminophen and an NSAID
    - Monitoring parameters
    - Activity, ambulation
    - IV access if indicated
    - Management of breakthrough pain
    - Treatment of adverse effects
    - When to notify anesthesia or primary care provider (e.g., unrelieved pain, excessive adverse effects)
- Monitor sedation and respiratory status every 1 to 2 hours for the first 24 hours after opioid therapy is initiated, then every 4 hours until IV or intraspinal opioid therapy is discontinued, then routine in stable patients (see Sedation Scale, Box 1).
- Monitor other vitals signs every 4 hours until IV or intraspinal opioid therapy is discontinued, then per routine in stable patients (evaluate need to monitor blood pressure more often in some patients).
- When possible, avoid sedating drugs for treatment of opioid-induced adverse effects, such as antihistamines for pruritus and antiemetics for nausea.
- Develop criteria for selecting appropriate patients to receive
    - Patient-controlled analgesia (PCA)
    - Family-controlled analgesia (parent or significant other)
    - Nurse-activated dosing (primary nurse)
- Teach patients, family members, and visitors about the proper use of PCA and the dangers of anyone other than the patient or an authorized person pressing the button.

Source: Pasero C, McCaffery M. Authorized and unauthorized use of PCA. Am. J. Nurs. 2005;105(7):30,31, 33; Pasero C, Portenoy RK, McCaffery M. Opioid analgesics, In: McCaffery M, Pasero C. *Pain: clinical manual*. 2nd ed. St. Louis, MO: Mosby; 1999 p. 161-299. Copyright Chris Pasero, 2005. Used with permission.

Research Implications

The evidence base supporting the use of analgesics to manage acute pain is strong and clear—to date, analgesics, particularly opioids, are effective in controlling acute pain. Undertreatment of acute pain, however, remains prevalent despite the availability of analgesics and guidelines. Undertreatment is attributed to clinician behaviors—lack of adequate pain assessment and inadequate prescription and administration of analgesics—that are modifiable.

Thus, the research in this area needs to be directed toward effective strategies for changing clinician attitudes and behaviors that will result in better pain management for patients.

The evidence base for the use of nondrug therapies to manage acute pain requires further development; the current knowledge does not support achieving consistent outcomes from these therapies. Lack of standardization of nondrug therapies is one of the drawbacks of the current literature. Using standard relaxation or massage techniques with a determined duration (i.e., dose) and frequency (i.e., interval) would improve our ability to summarize the literature and determine the effectiveness of these therapies for pain control.

Conclusion

Education about safe pain management will help prevent undertreatment of pain and the resulting harmful effects. Safety includes the use of appropriate tools for assessing pain in cognitively intact adults and cognitively impaired adults. Otherwise pain may be unrecognized or underestimated. Use of analgesics, particularly opioids, is the foundation of treatment for most types of pain. Safe use of analgesics is promoted by utilizing a multimodal approach, that is, using more than one type of analgesic to treat the individual's pain. Opioid use is often avoided or inadequate for fear of causing life-threatening respiratory depression. Nurse monitoring of sedation levels when opioids are initiated is one way to assure safety. While nondrug techniques pose minimal safety issues, the current evidence does not support that these techniques produce consistent, predictable pain management outcomes.

Search Strategy

The terms "pain assessment" and "pain management" were used in the literature search. The research was limited to the English language, published in the last 10 years, meta-analyses, practice guidelines, literature reviews, clinical trials, and randomized clinical trials (RCTs). The literature for nondrug techniques was searched using the key terms "relaxation," "music," "massage," "heat and cold," and "pain." The nondrug literature was limited to the English language, meta-analysis, and literature reviews.

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Evidence Table for Pain Assessment and Pain Management

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Anderson 2006[43]	Relaxation	Randomized controlled trial	Pain intensity Quality of life, cancer specific Mood Symptom severity Symptom interference Self-efficacy	Cancer clinic N = 57 chronic cancer pain requiring opioids	Relaxation Distraction Positive mood delivered via audiotape at home 20 minute tape used 5x/week for 2 weeks Wait listed control	Significant pre-post reduction in pain intensity using relaxation and distraction. No difference in outcome when adherence to intervention examined. No difference for positive mood on any outcomes. In poststudy interview, patients reported immediate relief with use of relaxation or distraction tape, but pain returned immediately after use. Some mismatch between patient preference and type of technique randomly assigned. Pain reduction was short.
Cashman 2004[37]	Respiratory and hemodynamic adverse events related to opioid analgesia	Systematic literature review	Respiratory depression Hypotension	Published literature 165 papers > 20,000 patients	Analgesic techniques IM PCA Epidural	Respiratory depression defined differently across studies; incidence differed based upon definition. Incidence of respiratory depression as measured by low ventilatory frequency < 1 percent. Incidence of hypotension related to analgesia < 5 percent .

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Cepeda 2007[50]	Music	Meta-analysis	Pain intensity Pain relief Opioid use	51 RCTs reviewed > 2,600 patients All types of pain	Music	Studies of postsurgical pain showed a 0.5 reduction in intensity with music (14 studies). Patient- versus provider-selected music showed no benefit in pain intensity. Patients exposed to music had 70 percent greater likelihood of reporting > 50 percent pain relief than those not exposed (4 studies). Patients exposed to music required 57 mg less of morphine in 1st 24 hours postsurgery than those not exposed (5 studies). No difference in medication side effects by use of music (4 studies). Clinical importance of benefit of music not clear.
Chandler 2002[64]	Heat/cold	Literature review		2 studies Acute pain		Limited evidence to support the use of heat for pain control in clinical settings.
Chang 2006[54]	Music	Randomized controlled trial	Pain intensity Heart rate (HR) Resp rate (RR) Blood pressure (B/P) Oxygen saturation (SpO2) Collected 15, 30, and 45 minutes after clamp applied	ICU in 2 acute care hospitals in Hong Kong N = 43 compression with C-clamp after percutaneous cardiac intervention	Patient selected music from 15 selections of soft, slow, nonlyric music Control: usual care	Significant difference in pain intensity after 45 minutes of compression. Patients exposed to music had significant reduction in pain. Patients in control group had significant increase in pain. HR, RR, and SpO2 significantly lower with music at 30 and 45 minutes compared to control. Systolic B/P, HR, and RR declined with music over time. Analysis controlled for multiple comparisons. Music has benefit during a painful procedure in ICU.

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
De Jong 2006[45]	Relaxation	Systematic literature review	Pain intensity Pain distress	11 studies reviewed Postsurgical and procedural (burn care) pain	Rhythmic breathing Simple relaxation	Review sought to identify evidence for simple relaxation techniques (e.g., breathing) on pain during burn wound care. No research published with adults during acute phase. Most promising technique is rhythmic breathing with jaw relaxation.
Dolin 2002[3]	Efficacy of analgesic administration techniques	Systematic literature review	Pain intensity Pain relief	Published literature 165 papers > 20,000 patients	Analgesic techniques IM PCA Epidural	Incidence of: Moderate to severe pain: 29.7 percent Severe pain: 10.9 percent Poor pain relief: 3.9 percent Fair-to-poor pain relief: 19.4 percent Highest incidence with IM technique. Significant decline in severe pain over time (years of publication).
Dolin 2005[38]	Adverse (side) effects to opioid analgesics via 3 modes of administration	Systematic literature review	Nausea Vomiting Sedation Pruritis Urinary retention	Published literature 283 papers > 100,000 patients	Analgesic techniques IM PCA Epidural	Incidence of adverse effects to opioids across all 3 techniques: Nausea: 25 percent Vomiting: 21 percent Mild sedation: 23.9 percent Excessive sedation: 2.6 percent Pruritis: 14.7 percent Urinary retention: 23 percent
Field 1998[57]	Massage	Literature review	Multiple outcomes of a wide variety of diseases		Massage therapy	Consistent findings are that massage decreases anxiety, depression, cortisol, and catecholamines. Massage and vibration studies for many types of pain included; weak evidence that moderate vibration for 25–45 minutes over extended time may reduce pain. Methodological problems in design (nonexperimental and/or nonrandom assignment) and sample size noted.

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
French 2007[63]	Heat/cold	Systematic literature review	Pain intensity Physical function Overall improvement Patient satisfaction Adverse effects	9 papers 1,117 patients Acute, subacute, and chronic low-back pain	Superficial heat/cold	Heat wrap produced a 17 percent reduction in pain after 5 days (2 studies). Disability reduced with heat wrap after 4 days (2 studies). Heat produced adverse effect (pinkness of skin) in 6/128 patients. Limited evidence that cold therapy has an effect on pain.
Good 2005[48]	Relaxation	Randomized controlled trial	Pain intensity Pain distress Opioid use Days 1 & 2 Secondary analysis of larger study included in lit review on music and relaxation	4 hospitals in United States N = 167 Intestinal surgery	Jaw relaxation Patient selected music (5 types) Combined relaxation + music Control: 15 minutes quiet rest	3 intervention groups reported significantly less pain than control group at rest and before and after recovery from ambulation (16–40 percent less). No difference among interneuron groups for pain intensity immediately after ambulation. Relaxation or music are effective in reducing acute pain; the combination did not improve effect.
Hattan 2002[60]	Massage	Randomized controlled trial	Psychological well-being (e.g., pain, anxiety, calm) Heart rate (HR) Resp rate (RR) Blood pressure (B/P)	Teaching hospital in United Kingdom N = 25 post-CABG patients	20 minute foot massage 20 minute guided relaxation Delivered on day 2 postsurgery Control: usual care	No difference in physiologic measures pre-post treatment. Significant difference in pre-post change in perception of calm; massage significantly higher than control; no significant difference between relaxation and control. No difference in change scores for pain, anxiety, relaxation, or rest.
Hulme 1999[59]	Massage	Randomized controlled trial	Pain intensity Analgesic use Quality of care (satisfaction)	Day surgery unit in United Kingdom N = 59 women day surgery for sterilization	5 minute foot massage postsurgery Control: usual care	Significant decrease in pain during the early postsurgical period (both groups). No difference in pain intensity reported by group. Pattern over time showed patients who received massage reported less pain than controls. No difference in analgesic use over the early and postdischarge periods.

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Hutchison 2007[4]	IV PCA analgesia	Literature review		Published literature	None	MEDMARX data on IV PCA errors identified most common errors and reasons for those errors. Recommendations from report outlined for prescription, administration, and modification of PCA analgesia.
Kwekkeboom 2006[46]	Relaxation	Systematic literature review	Pain intensity Pain distress Pain relief	15 RCTs published 1996–2005 Acute and chronic noncancer pain	Relaxation, 5 types PMR Autogenic Systematic Jaw relaxation Rhythmic breathing	8/15 studies had positive results for pain intensity. 8/13 had positive results for pain relief. Pain relief improved significantly only when relaxation used multiple times; single-use studies showed no difference. Relaxation reduced distress (4/5 studies). Insufficient evidence to support broad application of relaxation for pain control.
McRee 2003[61]	Massage	Randomized controlled trial	Anxiety Heart rate (HR) Blood pressure (B/P) Cortisol Prolactin Analgesic use	Hospital in United States N = 52 surgical patients	Swedish massage Music (1 selection) Massage + music 30 minutes for each group delivered presurgery Control: usual care	No difference among groups for pre- or post anxiety, prolactin, cortisol, physiologic variables, or analgesic use. Significant decline in anxiety, prolactin pre-post surgery for all groups. None of the interventions demonstrated a beneficial effect on outcomes in early period after surgery.
Pellino 2005[42]	Nondrug tool kits	Randomized controlled trial	Pain intensity Interference Anxiety Control over pain Opioid use	Hospital in United States N = 65 Elective orthopedic patients (total hip or knee)	Tool kit included Tape player Soothing music Relaxation tape 9 PMR) Massager (hand held, nonelectric) Stress ball Control: usual care	Patients receiving tool kits used more nondrug therapies postsurgically; control patients also reported using some nondrug techniques spontaneously. No difference between groups on pain intensity, interference, control, or anxiety. Patients with tool kits used significantly less opioid on day 2 but not day 1.

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Richards 2000[58]	Massage	Systematic literature review	Relaxation Comfort Sleep	22 studies Published 1980–1999	Massage	Consistent finding that massage decreased anxiety and/or tension (8/10 studies). Massage produced physiologic relaxation (7/10 studies). Massage has immediate benefit on pain (3/3 studies; cancer pain). Inconclusive findings of effect of massage on sleep related to methodological problems.
Roykulcharoen 2004[47]	Relaxation	Randomized controlled trial	Pain intensity Pain distress Anxiety Opioid use	Hospital in Thailand N = 102 adults; abdominal surgery	Systematic relaxation for 15 minutes after 1st ambulation via audiotape Control: 15 minutes quiet rest	Relaxation significantly reduced pain intensity and distress pre-post intervention. No difference in anxiety or opioid use.
Kshettry 2006[67]	Nondrug tool kits	Randomized controlled trial	Pain intensity Tension Heart rate (HR) Blood pressure (B/P) Complications	Hospital in United States N = 104 CV surgery in ICU	Combination of preop Guided imagery relaxation + gentle touch or light massage and postop music + gentle touch or light massage Control: usual care	Pain intensity and tension significantly lower for tool kit patients on days 1 & 2 postsurgery. No differences noted in physiologic variables between groups. No difference in complication rates. These nondrug techniques are safe and easy to use in an critical care area.

Source	Safety Issue Related to Clinical Practice	Design Type	Study Design & Study Outcome Measure(s)	Study Setting & Study Population	Study Intervention	Key Finding(s)
Seers 1998[44]	Relaxation	Systematic literature review	Pain intensity Pain distress Anxiety Analgesic consumption	7 RCTs 352 patients, 150 received relaxation training 33 studies did not meet inclusion criteria Surgical and procedural pain	Relaxation	3/7 studies showed significant reduction in intensity and/or distress. 4/7 showed no significant difference. No adverse effects reported. Weak support for relaxation for acute pain control.
Sendelbach 2006[53]	Music	Randomized controlled trial	Pain intensity Anxiety Heart rate (HR) Blood pressure (B/P) Opioid use	3 hospitals in United States N = 86 undergoing CV surgery	20 minutes of music twice/day for 3 days postsurgery Patient selected 1/3 choices Control: 20 minutes of rest twice/day	Significant reduction in pain intensity and anxiety pre-post treatment for patients exposed to music. No difference in physiologic variables between groups. No difference in opioid use between groups. Because of missing data, results reported for PO day 1 AM and PM and PO day 2 AM only.
Smith 2002[66]	Heat/cold	Randomized controlled trial	Pain Swelling Flexion Opioid use Blood loss Transfusion Length of stay	N = 84 Total knee replacement	Cold therapy via cryo-pad technology vs Compression bandage applied by surgeon	No difference in outcomes related to type of treatment. Cost analysis indicated compression bandage less costly and more efficient in terms of nursing time.
Taylor 2003[62]	Massage	Randomized controlled trial	Pain intensity Pain affect Anxiety Distress Analgesic use Systolic B/P Cortisol (24 hr urine) Complications Length of stay (LOS)	Teaching hospital in the United States N = 105 abdominal surgery for suspected gynecological cancer	45 minutes Swedish massage for 3 days postsurgery 20 minutes vibration for 3 days+ PRN postsurgery Control: usual care	Multivariate analysis revealed no differences among groups on intensity, pain affect, anxiety, or distress. No differences found for secondary outcomes (analgesic use, cortisol, B/P, complications, LOS). Some benefit for massage and vibration over usual care were found with univariate analyses, but differences were small and may not be clinically important.

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Voss 2004[52]	Music	Randomized controlled trial	Pain intensity Pain distress Anxiety	Hospital in United States N = 61 CV surgery patients	Patient selected music (6 types) Scheduled rest Control: usual care 30 minutes during chair rest	Significant reductions in pain intensity, distress, and anxiety pre-post chair rest for music and rest groups. Post hoc test indicated patients exposed to music reported significantly less pain intensity, distress, and anxiety than the rest or control patients. Music reduced outcomes from 57–72 percent after 30 minutes of chair rest compared to controls.
Wong 2004[56]	Massage	Pretest, post-test	Pain intensity Distress Heart rate (HR) Resp rate (RR) Blood pressure (B/P)	Teaching hospital in United States Postsurgical patients	20 minute foot and hand massage No control	Significant decrease in pain intensity and distress pre-post massage. Significant decrease in HR and RR; differences small and not clinically important. No difference in B/P pre- to postmassage.