Procedural pain management in patients with cancer
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Abstract
Pain has been identified as one of the most significant factors in patients' experience of cancer and its treatment. Pain experienced during cancer treatment procedures such as radiotherapy can be unpleasant and distressing for the patient, as well as for their family and carers. Nurses have an important role in assessing and managing any pain associated with such procedures. This article explores the procedural pain that may be experienced by patients in general, and by those with cancer specifically, and details the pharmacological and non-pharmacological strategies that nurses can use to manage this challenging complication.

Aims and intended learning outcomes
The aim of this article is to improve nurses' understanding of cancer pain and pain associated with cancer treatment procedures. While the article discusses procedural pain in general, there is an emphasis on pain experienced by patients with cancer during radiotherapy. It is important to note that the principles of procedural pain management should be considered in all settings and all patients. After reading this article and completing the time out activities you should be able to:
- Define procedural pain and its potential effects on patients.
- Discuss the effects of cancer pain and pain associated with cancer treatment procedures.
- Identify the factors that may influence the patient's experience of procedural pain.
- Understand the pharmacological and non-pharmacological strategies that may assist in the management of procedural pain.

Introduction
In 2012, an estimated 14.1 million new cases of cancer occurred worldwide, with the incidence predicted to reach 23.6 million by 2030 (Cancer Research UK 2018). Pain has been identified as the most challenging aspect of malignant disease (Oechsle et al 2013). Pain in patients with cancer is primarily related to direct tumour involvement, the build-up of cancerous cells in non-tumour-forming cancers such as leukaemia and the long-term effects of treatment. However, pain can also result from diagnostic or therapeutic procedures, such as radiotherapy (Chang et al 2000). In 2015-16, around 133,000 patients in England received radiotherapy (Public Health England 2017). This procedure can be an effective strategy for achieving rapid relief from the symptoms of cancer; however, a high proportion of patients with cancer receive radiotherapy daily and these patients are susceptible to increased pain and inadequate pain relief during the procedure (Pignon et al 2004).

There is a lack of evidence related specifically to procedural pain management in patients with cancer undergoing radiotherapy; this article uses the evidence relating to the management of procedural pain in general healthcare settings.
to enhance understanding in this area. It identifies the challenges of assessing and managing pain in these patients, and investigates the factors that may contribute to inadequate pain relief. This article also explores the pharmacological and non-pharmacological interventions that nurses can use to relieve procedural pain.

Cancer pain
It has been reported that 6-17% of patients with non-metastatic cancer experience pain directly attributed to cancer, while 35-56% of those with metastatic disease experience such pain (Davis and Walsh 2004). Bone metastases are one of the most common causes of cancer pain (Buga and Sarria 2012). Combining radiotherapy with pharmacological and non-pharmacological interventions, such as opioid analgesics and relaxation techniques, is recognised as the optimal approach to the management of skeletal pain (Raphael et al 2010).

Cancer pain is complex and can be caused by inflammation, ischaemia and the tumour compressing the surrounding tissues (Raphael et al 2010). Approximately one third of patients with cancer report experiencing neuropathic pain (Roberto et al 2016), which results from a tumour invading the nerve tissues, and can be particularly challenging to treat. Validated and reliable assessment tools, such as the Neuropathic Pain Scale (Galer and Jensen 1997), can improve nurses’ ability to diagnose neuropathic pain. Neuropathic pain can be challenging to identify because of the range of potential causes, symptoms and underlying mechanisms (Beniczky et al 2005), and ineffective pain assessment can lead to inappropriate pain management.

Cancer pain presents nurses with specific challenges because of its complex nature and the limited effects of standard pain relief, such as paracetamol, ibuprofen and dihydrocodeine tartrate. Patients with cancer pain who have been managed with opioids over a prolonged period may develop a tolerance to these drugs, which means that standard pain management plans may not be effective in improving pain associated with procedures such as radiotherapy. Therefore, management of pain in patients on long-term opioid therapy should include using multi-modal strategies, as well as higher doses of pain relief before these procedures (Huxtable et al 2011).

TIME OUT 1
Reflect on a situation where you provided care for a patient with cancer. Consider why they may have experienced increased pain during diagnostic or therapeutic procedures

Procedural pain
Puntillo et al (2001) defined procedural pain as an unpleasant sensory and emotional experience that arises from actual or potential tissue damage associated with diagnostic or therapeutic procedures. Such procedures are common in healthcare settings, and range from tasks such as dressing changes and venepuncture, to invasive procedures such as lumbar punctures, fracture reductions and biopsies (Czarnecki et al 2011).

One comparative descriptive study of intensive care units analysed pain intensity scores and use of analgesics during a range of nursing tasks, such as patient turning, wound drain removal and dressing changes, tracheal suctioning, femoral catheter removal, and central venous catheter insertion (Puntillo et al 2001). The study identified patient turning as the most painful procedure. This has repercussions for patients undergoing radiotherapy because of the degree of physical manipulation involved. Failure to adhere to evidence-based guidance for manual-handling procedures may also contribute to the development of pain.

Procedures that necessitate repeated interventions, such as radiotherapy, may reduce patient compliance because they anticipate experiencing pain (Price and Wibberley 2012). Further studies have reported significantly increased pain intensity scores in patients undergoing the following procedures:

- Endotracheal suctioning (Stanik-Hutt et al 2001).
- Wound and chest drain removal and arterial catheter insertion (Puntillo et al 2014).
- Complex wound care (Stotts et al 2004).
- Arterial blood sampling, and insertion of nasogastric tubes and central venous catheters (Morrison et al 1998).

Diagnostic procedures can cause pain resulting from larger needle sizes and the depth of insertion required to access body tissue for sampling, for example during biopsies. Studies have demonstrated high pain scores in patients undergoing prostatic needle biopsies (Shields and Vaganov 2013), bone marrow aspirations and biopsies (Lidén et al 2009), and needle and vacuum-assisted breast biopsies (Szynglarewicz et al 2011).

The literature indicates that healthcare professionals do not always assess and manage pain effectively before, during and after healthcare procedures. Nurses should regard all healthcare procedures as potentially painful interventions, rather than viewing them as tasks that need to be undertaken. Evidence-based guidelines should also be developed that support nurses in the provision of pharmacological and non-pharmacological interventions to manage patients’ procedural pain.

Importance of minimising procedural pain
Preventing and minimising pain are fundamental principles in healthcare settings and nurses have a duty of care not to cause unnecessary pain and to act in the best interests of their patients (Brennan et al 2007). If the patient is expected to undergo repeat procedures, such as radiotherapy, the provision of optimal pain relief, appropriate positioning and complementary therapies is essential, as is the development of individualised care plans to guide management during any repeat procedures. However, Harrison et al (2006) suggested that many healthcare organisations have not developed guidelines for procedural pain management. If healthcare organisations do not acknowledge that procedures have the potential to cause pain, they will be unable to effectively anticipate, assess, prevent and manage any associated pain.
Failure to effectively anticipate and manage procedural pain can result in adverse physical and psychological effects for patients. Mertin et al (2007) stated that the immediate physical effects of pain are related to the stress response, which can adversely affect the cardiorespiratory, metabolic and immune systems, which, in turn, can affect wound healing and tumour growth. Psychological effects for patients who have experienced procedural pain may include fear, anxiety, anger and aggression, low concentration, refusal to consent to further procedures and a lack of trust towards healthcare professionals (Brennan et al 2007). Although pain associated with procedures is classified as acute, there are links between procedural pain and the development of chronic pain – pain that persists for more than 12 weeks (The British Pain Society 2014) – if the procedural pain is not managed effectively (Shaw and Lamdin 2011). Subsequent management of chronic pain also represents an additional burden to healthcare organisations.

**Pain during radiotherapy**

While radiotherapy is not a painful procedure in itself, some of the circumstances related to its delivery can cause discomfort for patients. For example, it is important that patients undergoing radiotherapy remain still throughout the procedure because of the risk of the therapy being inadvertently delivered to areas of the body other than the target site. This means that patients undergoing radiotherapy are positioned onto hard surfaces for 5-20 minutes and offered a thin overlay mattress to ease their discomfort, since a thicker mattress could affect the table measurements and radiation-targeted beams used during radiotherapy. Furthermore, patients with head and neck cancers are required to wear protective head masks, which can further increase their discomfort. Patients who are left alone and must remain motionless in a windowless radiotherapy suite can experience heightened anxiety and pain, which can potentially reduce their compliance with the procedure and interrupt treatment. Some patients may experience anxiety-related reactions, for example claustraphobia resulting from a fear of the enclosed spaces involved in radiotherapy (Néron and Stephenson 2007). Fear and anxiety can provoke stress reactions and increase the likelihood of patients experiencing pain (Mertin et al 2007). This is particularly relevant to patients undergoing radiotherapy, which often involves multiple treatment sessions with few changes to the procedure itself.

Pignon et al (2004) conducted a cross-sectional study to evaluate the prevalence of pain in one radiotherapy department. They found that 71% ($n=66/93$) of patients experienced pain during radiotherapy, with 20% ($n=13/66$) of these patients experiencing total relief following treatment with analgesics. Furthermore, over two thirds of patients were dissatisfied with the input of medical staff in relation to their pain management, and over half of patients believed that the psychological support they received was inadequate. This demonstrates the need to adopt a multidisciplinary approach to pain management within radiotherapy settings and elsewhere to provide pre-emptive management of procedural pain.

**Pain assessment and preparation for procedures**

A comprehensive pain assessment should be undertaken during any initial consultation with a patient with cancer who is undergoing a potentially painful diagnostic or therapeutic procedure. The assessment should address physical and psychosocial factors, such as pain intensity, location and type of pain, any aggravating or relieving factors, levels of fear and anxiety, and the potential effect on the patient’s quality of life. Pain assessment tools can assist the nurse to accurately assess the patient’s pain; for example, numerical and verbal rating scales are considered valid and easy to use, particularly with older patients (Hjermstad et al 2011).

Following the assessment, the nurse should discuss and tailor pain management interventions, such as pain relief, appropriate positioning and complementary therapies, to meet the individual’s needs. The outcome of the initial pain assessment and any reassessment, and the effectiveness of any management interventions used, should be documented in the patient’s medical records. There appears to be a reciprocal relationship between anxiety and pain (Ligthart et al 2013), and an in-depth assessment of the patient’s pre-procedural anxiety should be included in their care plan. Providing education and information before any interventions can improve patients’ preparation and reduce the anxiety and pain associated with potentially painful procedures.

**Key points**

- Pain in patients with cancer is primarily related to direct tumour involvement, the build-up of cancerous cells in non-tumour-forming cancers such as leukaemia and the long-term effects of treatment. However, pain can also result from diagnostic or therapeutic procedures, such as radiotherapy (Chang et al 2000).
- The literature indicates that healthcare professionals do not always assess and manage pain effectively, during and after healthcare procedures. Nurses should regard all healthcare procedures as potentially painful interventions.
- A comprehensive pain assessment should be undertaken during any initial consultation with a patient with cancer who is undergoing a potentially painful diagnostic or therapeutic procedure. The assessment should address physical and psychosocial factors, such as pain intensity, location and type of pain, any aggravating or relieving factors, levels of fear and anxiety, and the potential effect on the patient’s quality of life.
- The appropriate timing of the administration of analgesics is essential to a patient’s positive experience of a procedure. Despite the availability of analgesics for procedural pain, studies indicate that these drugs are often not administered before procedures in anticipation of pain.
- Non-pharmacological interventions such as deep breathing techniques, the provision of information and nurses’ use of a ‘calming voice’ can reduce patients’ anxiety and pain intensity during procedures.

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Identifying at-risk patients

It is important for nurses to be aware of the factors that can increase the susceptibility of patients with cancer to pain during treatment. Awareness of the predictive risk factors for procedural pain can assist nurses to identify at-risk patients who may require pharmacological and non-pharmacological interventions. Patient-related risk factors for procedural pain include (Liden et al 2009):

» Aged under 60 years.
» Increased anxiety levels.
» Lack of pre-procedural information.
» Low employment status, for example those who are on sick leave or unemployed.
» Pre-existing pain and opioid tolerance involving chronic pain.

Studies have also demonstrated that women (Faigeles et al 2013) and patients with an African-American ethnic background (Edwards et al 2001) are increasingly likely to report higher levels of clinical pain. Cultural differences within cancer populations have also been reported; for example, Reyes-Gibby et al (2012) found that patients who were Hispanic and black presented with higher incidences of severe pain at first consultation than patients who were white.

There is evidence to suggest that ageing decreases pain sensitivity (Petrini et al 2015, Lautenbacher et al 2017); therefore, older patients may be less likely to report pain and request analgesics. Cognitive impairment may also prevent older people from communicating pain effectively and requesting pain relief. In this case, pain assessment tools that are tailored for older patients with dementia and communication difficulties should be used. The Abbey Pain Scale (Abbey et al 2004) is a valid and easy-to-use assessment tool that measures behavioural and physiological changes, and which may indicate that a patient is experiencing increased levels of pain in those who are unable to self-report this.

The type of cancer that a patient has can also affect their susceptibility to pain during treatment. Grund et al (1996) conducted a large prospective study to evaluate the causes of cancer pain in 2,266 patients referred to a pain service. They found that 77% (n=1,745) of patients reported severe pain, with the highest prevalence in patients with advanced head and neck cancers, gastrointestinal malignancies and genitourinary tumours. It was identified that 80% (n=1,813) of patients experienced pain in more than one anatomical site, while 10-20% (n=226 to 443) of patients experienced pain related to cancer treatments.

Pharmacological management of procedural pain

A range of strategies have been investigated for their ability to manage procedural pain. For example, one randomised controlled trial examined the effects of 2.5mg versus 7.5mg intravenous boluses of morphine in cardiothoracic patients undergoing either patient turning or chest drain removal, and reported that there were no significant differences between the groups (Ahlers et al 2012). Arroyo-Novoa et al (2011) conducted a study of 11 patients undergoing open wound care procedures that aimed to determine the efficacy of low-dose ketamine added to intravenous morphine versus intravenous morphine alone. The results demonstrated significant reductions in pain intensity in the low-dose ketamine group compared with the morphine-only group. However, adverse effects such as hallucinations and blurred vision were reported in 91% of participants in the ketamine and morphine group, compared with none in the morphine-only group.

The use of nitrous oxide in the form of ‘gas and air’ (50% nitrous oxide, 50% oxygen) for pain control during procedural interventions has been well-documented. Nitrous oxide is considered a safe and fast-acting form of anaesthesia used in obstetrics, emergency departments and dental practices worldwide (Howard 1997). Nitrous oxide is effective in the management of pain associated with transrectal ultrasound-guided prostatic biopsies (Masood et al 2002), lithotripsy (a procedure that breaks up small calculus such as kidney or bladder stones) (Mazdak et al 2007), flexible cystoscopy (endoscopy of the urinary bladder via the urethra) (Callery et al 2007) and minor urological procedures (Young et al 2012). Findings from these studies suggest that nitrous oxide significantly reduces pain intensity without causing adverse effects. However, there are practical considerations that would need to be addressed before nitrous oxide could be introduced in radiotherapy settings. For example, nitrous oxide inhalation is self-administered via a hand-held device and patients undergoing radiotherapy are required to remain still during the procedure. Similarly, patients with head and neck cancer are required to wear protective face masks during treatment, ruling out the use of nitrous oxide.

The appropriate timing of the administration of analgesics is essential to a patient’s positive experience of a procedure. Despite the availability of analgesics for procedural pain, studies indicate that these drugs are often not administered before procedures in anticipation of pain. For example, Arroyo-Novoa et al (2008) reported that only 5% (n=39/755) of patients received analgesics or sedatives within one hour of endotracheal suctioning, while further studies found that less than 20% of adult patients undergoing potentially painful procedures received preparatory opioid analgesics (Puntillo et al 2001), and that nurses frequently wait for patients to self-report pain before administering analgesics (Twycross 2002). Although pain can be significantly increased for up to five minutes following turning in critically ill trauma patients, inconsistencies in administering pre-procedural analgesics have been reported, with drugs administered anywhere between ten minutes and 10.5 hours before turning (Stanik-Hutt et al 2001).
In the author’s clinical experience, patients may fail to request analgesics when they require them and in anticipation of pain for a variety of reasons, such as language and communication difficulties, mental health issues, cognitive impairment, and reluctance to interrupt nurses’ work. Providing patient education is essential, since those who do not report or anticipate pain are less likely to receive pre-procedural analgesics.

**TIME OUT 3**

Think about a patient with cancer you have cared for who required a potentially painful procedure. What factors would you need to consider when administering analgesics? For example, would you administer the analgesic before the procedure, or during; and which analgesic would you consider?

Bell and Butler (2013) examined five case studies in which fentanyl pectin nasal spray was used in the management of breakthrough pain (sudden increase in pain that may occur in patients who already have chronic pain from cancer or other conditions) in cancer, with the emphasis on predictable pain during radiotherapy. The researchers concluded that all patients achieved clinically significant reductions in pain intensity scores.

Oral transmucosal fentanyl citrate (OTFC) is a short-acting immediate release opioid, which has a reported onset of 5-10 minutes and a terminal half-life (the time it takes for half of the drug to be eliminated from the bloodstream) of up to two hours (Scott 2008). Short-acting medicines are useful in the treatment of procedural pain because they can be relied on to take effect before the procedure; this is in contrast to other drugs such as oral morphine solutions, which can take 20-30 minutes to reach their therapeutic effect, thus not allowing the drug enough time to reach its desired peak effect (Jenkins 2009).

Several studies have investigated the use of non-pharmacological strategies to reduce patients’ pain during procedures. For example, there is evidence to support the use of relaxation and distraction techniques in patients with burns undergoing dressing changes (de Jong et al 2007, Park et al 2013). Faigeles et al (2013) reported that non-pharmacological interventions such as deep breathing techniques, the provision of information and nurses’ use of a ‘calming voice’ can reduce patients’ anxiety and pain intensity during procedures.

While evidence supporting the use of music therapy such as pillow speakers in reducing procedural pain is lacking, there is evidence to support its use in reducing high levels of anxiety related to potentially painful procedures. For example, studies have demonstrated the effectiveness of music therapy to reduce patients’ anxiety levels during dental procedures (Newton 2009), cardiac angiography (Weeks and Nilsson 2011), and endoscopic procedures (Hayes et al 2003, Rudin 2007). Gillen et al (2008) evaluated the evidence for the effects of music therapy on patients’ anxiety levels before invasive healthcare procedures, finding that it consistently had significant positive effects on the psychological parameters of pre-procedural state anxiety, but no consistent positive effects on the physiological parameters.

**TIME OUT 4**

Consider the pharmacological interventions that can be used in patients undergoing potentially painful procedures. Consult with your colleagues to ensure that appropriate pharmacological interventions are being administered in your clinical area. Could the timing of these interventions be improved, and are patients being offered pre-procedural pain relief where required?

**Non-pharmacological management of procedural pain**

Several studies have investigated the use of non-pharmacological strategies to reduce patients’ pain during procedures. For example, there is evidence to support the use of relaxation and distraction techniques in patients with burns undergoing dressing changes (de Jong et al 2007, Park et al 2013).

**TIME OUT 5**

Reflect on a situation when you could have used a non-pharmacological intervention to improve a patient’s pain management. What strategies would you have used and how might they have assisted the patient? If you have not used such interventions in your practice, consider if you would do this in the future, and, if so, which strategies might you use?

**Conclusion**

While it might not always be possible to completely alleviate pain or avoid undertaking painful procedures in patients with cancer, nurses can take steps to minimise the distress that patients may experience. Pre-procedural assessment strategies should be used that consider the patient’s demographic characteristics, existing pain, current analgesic use and anxiety levels. It is important that nurses understand the pharmacological and non-pharmacological strategies that may be effective in managing procedural pain. They should also be aware of the risk factors that can increase a patient’s susceptibility to procedural pain, to enable them to identify patients who may require additional interventions and support.

**TIME OUT 6**

Consider how managing procedural pain in patients with cancer relates to The Code: Professional Standards of Practice and Behaviour for Nurses and Midwives (Nursing and Midwifery Council 2015) or, for non-UK readers, the requirements of your regulatory body.

**TIME OUT 7**

Now that you have completed the article, reflect on your practice in this area and consider writing a reflective account: rcni.com/reflective-account


Procedural pain management in patients with cancer

TEST YOUR KNOWLEDGE BY COMPLETING THIS MULTIPLE-CHOICE QUIZ

1. Pain management involves:
   a) Pharmacological intervention only
   b) Anticipating, assessing and managing pain
   c) Distraction techniques only
   d) Non-pharmacological intervention only

2. Which statement is true?
   a) It is more common for patients with non-metastatic cancer to experience pain directly attributed to cancer compared with those with metastatic disease
   b) Standard pain relief, such as paracetamol, ibuprofen and dihydrocodeine tartrate, is always effective in relieving cancer pain
   c) Cancer pain is complex and can be caused by inflammation, ischaemia and the tumour compressing the surrounding tissues
   d) Patients with cancer pain who have been treated with opioids over a prolonged period never develop a tolerance to these drugs

3. Which of the following is not an accurate description of procedural pain?
   a) Procedural pain is an unpleasant sensory and emotional experience
   b) Procedural pain is caused only by mechanical procedures such as ultrasound scans or radiotherapy
   c) Procedural pain arises from actual or potential tissue damage associated with diagnostic or therapeutic procedures
   d) Procedural pain may result from nursing tasks such as dressing changes or venepuncture, or invasive procedures such as biopsies

4. Which of these procedures may result in increased pain intensity scores?
   a) Endotracheal suctioning
   b) Chest drain removal
   c) Complex wound care
   d) All of the above

5. One risk factor for procedural pain is:
   a) Age over 60 years
   b) Low anxiety levels
   c) Absence of pre-procedural pain
   d) Low employment status

6. Which pain assessment tool can be used in patients who are unable to self-report pain?
   a) Abbey Pain Scale
   b) Brief Pain Inventory
   c) Verbal Rating Scale
   d) Geriatric Pain Measure

7. ‘Gas and air’ is comprised of:
   a) Nitrous oxide and morphine
   b) Nitrogen and oxygen
   c) Nitrous oxide and oxygen
   d) Diacezam and oxygen

8. Which statement is false?
   a) The timing of the administration of analgesics is essential to a patient’s positive experience of a procedure
   b) Patients who do not report or anticipate pain are more likely to receive pre-procedural analgesics
   c) Studies indicate that analgesics are often not administered before procedures in anticipation of pain
   d) Oral transmucosal fentanyl citrate has a quicker onset of action than oral morphine solutions

9. Patients might fail to request analgesics when they require them as a result of:
   a) Language and communication difficulties
   b) Mental health issues
   c) Cognitive impairment
   d) All of the above

10. Which non-pharmacological intervention has been found to reduce patients’ anxiety levels related to potentially painful procedures?
    a) Allowing the patient to move around during the procedure
    b) Providing a thicker mattress
    c) Music therapy
    d) Frequent repositioning

How to complete this quiz

This multiple-choice quiz will help you to test your knowledge. It comprises ten questions that are broadly linked to the CPD article. There is one correct answer to each question.

» You can test your subject knowledge by attempting the questions before reading the article, and then go back over them to see if you would answer any differently.

» You might like to read the article before trying the questions.

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This multiple-choice quiz was compiled by Jason Beckford-Ball

The answers to this multiple-choice quiz are:

This activity has taken me minutes/hours to complete. Now that I have read this article and completed this assessment, I think my knowledge is:

Excellent  □  Good  □  Satisfactory  □  Unsatisfactory  □  Poor  □

As a result of this I intend to:

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