Postoperative pain management

Pain is a common concern for patients about to undergo surgery.

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The most common concern of patients scheduled for surgery is postoperative pain. Unfortunately, in spite of all the available analgesic drugs and modern devices, the vast majority of inpatients and day patients suffer from moderate to severe pain.[1] Postoperative pain is not merely unpleasant for the patient and his/her relatives, but may increase the postoperative morbidity and mortality, length of stay in hospital and number of unanticipated re-admissions. Furthermore, uncontrolled postoperative pain may lead to persistent pain conditions that may be very difficult to treat. Risk factors for the development of persistent pain are the severity of pre- and postoperative pain, intraoperative nerve damage and psychological vulnerability.[2] In terms of patient safety and satisfaction, adequate postoperative pain control is important and part of good clinical practice. This article discusses the postoperative management of adults; for the pain management of paediatric and geriatric patients please refer to the appropriate textbooks.

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Assessment of pain

Good-quality postoperative pain control requires the correct assessment of pain levels. Many nurses and physicians consistently underestimate high levels of pain,[3] and consequently tend to treat postoperative pain insufficiently. Other reasons for undertreating postoperative pain include myths about pain, such as that pain is necessary, beneficial, natural or unavoidable; myths about the abuse of and addiction to opioids used postoperatively; and the fear of side-effects of opioids such as respiratory depression and constipation.

Pain is defined as a subjective experience. In the absence of an objective measurement, we have to take the patient's word for it. Several pain scales are available, the most simple being the Visual Analogue Scale (VAS) and the Verbal Numerical Scale (VNS). The VAS is a 100 mm scale marked 'no pain' on the left-hand side, and 'worst pain' on the right-hand side (Fig. 1). A sliding bar is placed at a position that the patient feels represents his/her pain level appropriately. The other side of the scale has numbers (0 - 10) for the caregiver to record pain levels. The VNS aims at asking the patient to rate his/her own pain by assigning a number from 0 to10 to express the intensity of the pain. Zero indicates no pain, while 10 denotes the worst imaginable pain. The regular assessment of postoperative pain scores (e.g. 4 times a day) is required for improving postoperative pain management – it is the only way to assess the analgesic need of the individual patient and to evaluate the efficacy of administered analgesics. In this regard it is useful to view pain scoring as a '5th vital sign', along with blood pressure, pulse rate, temperature and respiratory rate.

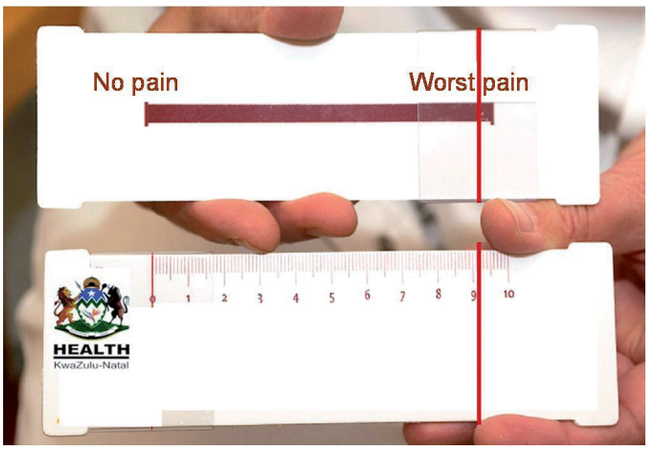

Fig. 1. The VAS ruler (for details see next).

Side-effects of opioids

Some physicians, nurses, patients and their relatives fear the side-effects of opioids, especially respiratory depression. Many caregivers also fear that patients may deliberately report high pain scores in order to be given additional doses of opioids. Apart from some isolated cases, the latter does not appear to be a problem, especially if opioids with fewer pleasurable side-effects are used (morphine instead of pethidine), and patients are monitored well. Respiratory depression may be a life-threatening side-effect of an overdose of opioids. Fortunately this side-effect rarely occurs postoperatively, and it may be prevented by assessing the level of sedation of patients using opioids after an operation. Sedation almost invariably precedes respiratory depression in patients using opioids.

Several tools to assess sedation are available (e.g. the Ramsay Sedation Scale and the Richmond Agitation Sedation Scale), most of which were developed in the intensive care setting (Tables I and II). Although monitoring of sedation will reveal overdosing of opioids, it does not imply that sedation necessarily indicates sufficient analgesia.[4] For such cases rescue analgesia should be available.

Postoperative pain management – general principles

Nociception is the registration of painful stimuli by the body and is associated with stimulation of pain receptors (nociceptors) in the skin, muscles, joints, intestines, peritoneum, pleura, meninges, etc., all of which may be damaged during surgery. Nerves may also be damaged, leading to neuropathic pain. Tissue damage will stimulate nociceptors and generate an action potential, which is transmitted by thin myelinated Aδ fibres and unmyelinated C fibres (both are called primary afferents) to the dorsal horn in the spinal cord. Due to sensitisation of the nociceptors the threshold for stimulation is lowered – i.e. peripheral sensitisation. In the dorsal horn the pain signal is transmitted, via the synapses that exist between the primary afferents and the ascending tracts, to the brain stem (spino-reticular and spino-mesencephalic tract) and the thalamus (spino-thalamic tract).

Pain stimuli are subject to intense modulation in the dorsal horn. Lowering of the stimulus threshold may occur in the synapses in the dorsal horn (central sensitisation), and continuous and intense stimulation may lead to prolonged, repeated post-synaptic depolarisation (wind-up). Conversely, descending systems exist that usually inhibit transmission of the pain signal. Substances involved in pain inhibition include GABA, endogenous opioids and serotonin. Finally, nociceptive stimuli are subject to strong modulating influences in the brain. Postoperative pain management aims at altering the emotional component of pain and modulating the different levels of pain transmission. The intention is to target different mechanisms of pain with different analgesics (multimodal analgesia) by combining analgesics with different modes of action. In this way it is possible to reduce the dose of analgesics (especially opioids), avoiding undesirable side-effects and increasing their efficacy.

Table I. Ramsay Sedation Scale

Sedation level	Description
1	Anxious and agitated
2	Co-operative, tranquil, orientated
3	Responds only to verbal commands
4	Asleep with brisk response to light stimulation
5	Asleep with no response to light stimulation
6	Non-responsive

Pre-operative phase

The patient should be informed about the expected level of postoperative pain associated with the operation and about the methods of providing analgesia. One of the objectives of premedication is to initiate analgesic management before surgical tissue damage has occurred. Although this concept of pre-emptive analgesia has been challenged,[5] the duration of action of analgesics such as paracetamol and a non-steroidal anti-inflammatory drug (NSAID) as part of the premedication will extend well into the postoperative period. Note that the classic NSAIDs, such as diclofenac, ibuprofen, naproxen, ketorolac and indomethacin, increase the tendency to bleed. Caution is warranted in major surgery in which much blood loss is anticipated and in neurosurgical procedures of the spine or the brain. There is some evidence of delayed bone union after the administration of NSAIDs. It may be advisable to avoid these drugs in cases of osteosynthesis of pelvic fractures or malunion. If available the newer COX-2 inhibitors, such as celecoxib, rofecoxib, valdocoxib and parecoxib, may be preferable to the classic NSAIDs in selected patients because of the more favourable side-effect profile.

Intraoperative phase

When choosing an intraoperative anaesthesia technique, the expected level of postoperative pain plays an important role. If possible, painful procedures under general anaesthesia should be combined with a regional technique such as an epidural or plexus catheter. Patients undergoing a laparotomy or thoracotomy should have an epidural catheter inserted at the appropriate dermatomal level, provided the expertise for insertion and monitoring is available. Patients undergoing procedures of the extremities that produce moderate postoperative pain for more than 6 hours (e.g. osteotomy of the hand or foot and removal of internal fixation material) should receive plexus analgesia with a long-acting (12 - 24 h) local anaesthetic, or continuous plexus analgesia using a catheter (Fig. 2). Patients undergoing procedures of the extremities that are known to cause severe postoperative pain (e.g. total knee replacement) should be managed by means of an epidural catheter or continuous plexus analgesia.

Table II. Richmond Agitation Sedation Scale (RASS)

Target RASS	RASS description
+4	Combative, violent, danger to staff
+3	Pulls or removes tube(s) or catheters, aggressive
+2	Frequent non-purposeful movement, fights ventilator
+1	Anxious, apprehensive, but not aggressive
0	Alert and calm
-1	Awakens to voice (eye opening/contact) >10 s
-2	Light sedation, briefly awakens to voice (eye opening/contact) <10 s
-3	Moderate sedation, movement or eye opening, no eye contact
-4	Deep sedation, no response to voice, but movement or eye opening to physical stimulation
-5	Not arousable, no response to voice or physical stimulation

Postoperative phase

After all surgical procedures one aims to achieve a pain score of 4 or less. If mild or moderate pain is expected a combination of paracetamol and a NSAID may be used. In adults the maximum dose of paracetamol is 60 mg/kg/24 h. This translates into 1 g 6-hourly for a patient weighing 70 kg. Paracetamol may be given orally, rectally or intravenously, depending on availability and type of surgery. The only absolute contraindication is allergy to paracetamol. Side-effects are rare when used in approved dosages. In the absence of contraindications to NSAIDs (kidney or liver failure, peptic ulcer, haemorrhagic cerebrovascular accident, severe congestive cardiac failure, dehydration, or allergy to NSAIDs), they should be added to the paracetamol. Both paracetamol and NSAIDs should be

administered at fixed times rather than prn. Instead of the classic NSAIDs, the newer COX-2 inhibitors may be prescribed. Even in cases of mild to moderate pain, a rescue opioid should be available, such as codeine (60 mg prn *per os*) or tramadol (50 mg prn *per os*). Codeine and tramadol may cause constipation, nausea, vomiting, and drowsiness. Codeine is contraindicated in patients with raised intracranial pressure, epilepsy, severely limited respiratory reserve, or a known allergy to codeine. Tramadol is contraindicated in patients with severe kidney or liver failure or a known allergy to tramadol. Pethidine is best avoided because of its short duration of action and the possibility of accumulation of the metabolite norpethidine, which may cause convulsions. If analgesia is insufficient, intramuscular morphine can be administered at a dose of 0.1 - 0.2 mg/kg.

If severe postoperative pain is anticipated the preferred management is by means of an epidural catheter or continuous plexus anaesthesia, or, if unavailable, by patient-controlled analgesia using intravenous morphine. Whatever the chosen technique, it should always be combined with paracetamol and a NSAID at fixed times. The most important side-effects of epidural analgesia are motor block, urine retention, infection, systemic toxicity of local anaesthetics and intraspinal bleeding. Side-effects of plexus anaesthesia include systemic toxicity of local anaesthetics, nerve damage, infection and those related to the site of insertion, such as pneumothorax. Morphine may cause nausea, vomiting, constipation, sweating, dry mouth, skin reactions, itch, confusion, urine retention, gastrointestinal dysfunction and respiratory depression (usually preceded by sedation). In the absence of these techniques or if contraindications prevent their use, intramuscular morphine can be prescribed. It should be borne in mind that intramuscular morphine may not suffice to suppress severe pain, especially if the pain is associated with movement.

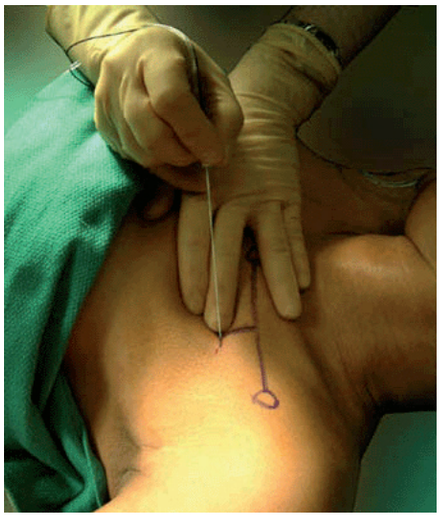

Fig. 2. Infraclavicular approach of the brachial plexus using nerve stimulation.

Nausea and vomiting

Surgery, anaesthesia and the use of opioids in the postoperative period will cause nausea and/or vomiting in some patients. It is therefore imperative to have anti-emetic therapy available. In patients at risk of postoperative nausea and/or vomiting it may be useful to administer dexamethasone and dehydrobenzperidol (Droperidol) or a 5HT-antagonist (ondansetron, granisetron, tropisetron, dolasetron) at the start of surgery. Those at risk include non-smokers, female patients, patients with a history of motion sickness and patients undergoing breast, ear or eye surgery. In general a combination of different anti-emetics, with different modes of action, is more effective than monotherapy. Postoperatively, the therapeutic options include dehydrobenzperidol (0.625 mg IVI or IMI), a 5HT-antagonist or metoclopramide. Dehydrobenzperidol is contraindicated in patients allergic to it, patients who are deeply sedated, and those with severe psychiatric depression or phaeochromocytoma. Metoclopramide should not be administered to patients with epilepsy, bowel obstruction or perforation, or phaeochromocytoma. 5HT-antagonists are generally safe; the only contraindication is a known allergy to this class of drugs.

Summary

Patients are entitled to high-quality postoperative management, both for humanitarian and medical reasons. It is possible to achieve this with present-day techniques and human resources. Assessment of postoperative pain levels by the patient and employment of a multimodal programme are essential for successful control of postoperative pain. Doctors and nurses should be conscious of possible side-effects of drugs and techniques. Nausea and vomiting should not automatically result in cessation of opioid therapy; multimodal anti-emetic therapy should first be instituted.

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In a nutshell

- Postoperative pain is a common concern among patients and their families.
- Pain levels should be assessed objectively by using pain scales.
- Opioids are often avoided because of fears of side-effects or addiction, both of which are rare in postoperative patients.
- In the management of postoperative pain, the intention is to target different mechanisms of pain with different analgesics (multimodal analgesia) by combining analgesics with different modes of action.
- The patient should be informed about the expected level of postoperative pain associated with the operation, and about the methods of providing analgesia.
- One of the objectives of premedication is to initiate analgesic management before surgical tissue damage has occurred.
- After all surgical procedures, the aim is to achieve a pain score of 4 or less.
- If severe postoperative pain is anticipated the preferred management is by means of an epidural catheter or continuous plexus anaesthesia, or, if unavailable, by patient-controlled analgesia using intravenous morphine.
- Anti-emetic therapy is required if opioids are used to control postoperative pain.
- Patients are entitled to high-quality postoperative management which is possible to achieve with current techniques.