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General Considerations for Pain Management upon Initial Presentation and during Hospital Stay

Karol Mathews

The quest for relief from pain is pursued in human medicine because its existence is known since the patient can verbalize their pain: what it feels like, where it is and the relief they feel when treatment is appropriate. As we all have experienced pain of various degree and duration, it is an excellent topic for comparison and understanding with our veterinary patients. As veterinary patients cannot tell us how painful they are, we as veterinarians and veterinary technicians/nurses have to understand what can cause pain and how pain manifests itself, which is discussed throughout this book, and how best to treat it.

Upon presentation immediate and appropriate treatment for the presenting problem should begin. Managing these problems frequently relieves some of the pain experienced (e.g. cooling a burn). The analgesic procedures are included in the scenarios; however, for definitive management of the presenting problem, the reader is referred elsewhere. Initial management is also based on inclusion/exclusion of pre-existing problems, medications and when the patient was last fed. An additional factor is the aggressive nature of the patient and how to deal with that (Chapter 22). Frequently, patients require diagnostic imaging and some may require surgical management. Specific analgesic/anesthetic protocols will be required for each circumstance. Preparation for intubation and assisted ventilation is essential. As cardiac arrhythmias may occur within 12–24 h (if not already present) following trauma, continuous ECG monitoring must be included in the ongoing patient assessment.

While management procedures contribute to a reduction in the pain experienced, analgesics are an essential component of case care in the urgent and emergent trauma, and for many critically ill, patients. Some degree of inflammation is present in these patients and is associated with great energy expenditure, the demands for which frequently cannot be met. The addition of pain, a great utilizer of energy, can contribute to associated morbidity, especially in the more seriously affected patients. In addition to the pain experienced by the primary problem, there is an additive effect of pain due to placement/presence of IV, urinary, thoracic, abdominal catheters and drains. Many undergo frequent manipulations and procedures that contribute to the overall pain experienced. Prior to analgesic and anesthetic selection, the pharmacologic aspects and contraindications for the various agents must be considered due to the fragile organ function of many of our ill or injured patients. Refer to the pharmacology and clinical application of sedatives (Chapter 9), opioids (Chapter 10), non-steroidal anti-inflammatory analgesics (Chapter 11), adjunct analgesia (Chapter 12) and anesthetics (Chapter 13). As pain is an individual experience associated with specific situations, general dosing of analgesics may not be appropriate. Refer to Chapter 8 for analgesic dosing suggestions for various levels of pain and the individual scenario chapters.

A common misconception is that analgesics mask physiological indicators of patient deterioration (e.g. tachycardia in response to hypotension) and are, therefore, withheld. Evidence to support that analgesics *do not* mask signs of patient deterioration is reported in both the human and veterinary literature [1]. In fact, improved outcomes of well-managed pain in trauma patients is reported [2]. Our clinical observations show that when opioids are administered as a slow push or as a continuous rate infusion to treat pain an appropriate heart rate in response to hypotension, hypoxia, hypovolemia or hypercarbia still occurs. As tachycardia frequently occurs in the painful patient, treating the pain and eliminating this component as a cause for tachycardia, the persistence or recurrence of increased heart rate alerts the clinician to potential patient deterioration. If appropriate analgesia is not administered, tachycardia may be assumed to be pain and not patient deterioration. It is essential to obtain intravenous (IV) access, collect blood for laboratory evaluation and commence fluids while initiating opioid analgesia. Where hemorrhage or other hypovolemic states may exist, the severity of intravascular volume loss may be masked by the pain-induced “artificial” blood pressure (BP) reading. With administration of an analgesic, the pain-induced sympathetic response is reduced, allowing the BP reading to reflect the true intravascular volume. Heart rate will still reflect volume loss. Studies confirm that opioids do not result in a deterioration in hemodynamics when administered to dogs with 30% blood loss. Should BP drop below normal during opioid administration, this reflects that hypovolemia and fluid administration should be increased to that required for the patient. Where blood loss is identified, continuous monitoring of BP and laboratory evaluation is essential to identify the patient requiring a blood transfusion. The biochemistry results will identify organ dysfunction and will assist with selection of an analgesic protocol—and an anesthetic protocol should this be required.

Another concern expressed by many veterinarians is the potential for adverse reactions associated with analgesic drug administration, especially so for cats. However, current evidence, based on many studies investigating the efficacy and tolerability of analgesics of several drug classes, indicates that adverse effects are minimal when used appropriately [3]. This applies to both cats and dogs [4]. Adverse effects, primarily those associated with opioid use, such as respiratory depression, are extrapolated from humans and are over-emphasized in dogs and cats. In thirty years of practice in the critical care setting, this author has witnessed only two such incidences, both associated with fentanyl patch application in very small dogs. With respect to ventilation, opioid administration after a traumatic incident frequently improves ventilation rather than impairs it. This has been confirmed by arterial blood gas assessment by the author. Based on the physiologic abnormalities present in the ill or injured cat and dog, selection, dosing and method of administration of analgesics require careful consideration to ensure efficacy without the potential for adverse effects. As an example, non-steroidal anti-inflammatory analgesics (NSAIDs) should never be administered to any ill or injured patient upon presentation (Chapter 11). The administration of NSAIDs in the emergent patient should be withheld until the volume, cardiovascular, liver and kidney status of the patient is determined to be within normal limits and there is no potential for deterioration, such as ongoing or occult hemorrhage. Human patients with severe or poorly controlled asthma, or other moderate to severe pulmonary disease, may deteriorate with **cyclooxygenase 1 (COX-1) selective NSAID** administration [5]. It is not known whether this may occur in cats and dogs; however, as bronchodilator physiology is similar across species, this may still be a concern. As asthmatic patients receive glucocorticoid therapy, NSAID would be contraindicated. COX-1 selective NSAIDs are not recommended for any patient scenario included in this book.

Concerns for opioid immunosuppressive effects, and subsequent infection, have been reported in the human literature. Based on the author’s experience working with critically ill patients all receiving opioids, infections potentially associated with opioid use were not identified. However, as the immunosuppressive potential of some opioids, especially morphine, was

raised [6], a two-month prospective study was carried out at the author's institution, including all patients (ICU and surgical ward) with a variety of problems receiving opioids. Fentanyl, hydromorphone and buprenorphine were opioids used predominantly, in addition to NSAIAAs, which demonstrated a 6/140 (4.3%) new infection rate. Survival rate was 98% with 2% euthanasia due to poor prognosis (e.g. neoplasia, severe head trauma). As with other reported studies, the tibial plateau levelling osteotomy (TPLO) procedure was the major orthopedic procedure represented in the infection rate (two of the six patients acquiring infections). Interestingly, critically ill patients rarely acquired infection, whereas the TPLO procedure is performed in healthy dogs. An earlier study investigating surgical site infections (SSIs) in dogs at the same institution receiving opioids during hospitalization included 846 dogs over a 45-week period and identified 26 (3%) SSIs [7]. A recent study in healthy dogs reported that morphine and buprenorphine did not alter leukocyte production, early apoptosis or neutrophil phagocytic function [8]. It is important to add that pain, and associated stress, is immunosuppressive and the withholding of analgesics based on a potential problem may increase morbidity rather than prevent it. In addition, the effect of hospitalization alone on the stress response in cats [9] and dogs [10, 11] has been described and this stress could have profound effects on the immune system [12], especially when associated with trauma [13]. Pain will compound this stress, illustrating the importance of appropriate analgesia [14].

Many ill or injured animals will require diagnostic and emergency procedures where analgesia, to facilitate restraint, is essential. As each animal will present with varying levels of injury or illness and experience different levels of pain, one cannot apply a standard regimen for all patients. An opioid is the analgesic of choice for initial management; however, dose and method of administration is patient- and situation-dependent and is described in the individual scenarios in this book. In the immediate post-traumatic event, the stress response may reduce the pain experienced below that expected for the associated injury. Therefore, bolus administration of analgesics is not advised due to the potential for adverse effects (panting, nausea, vomiting, dysphoria) when the amount administered is excessive for the degree of pain experienced. "A single dose does not fit all"; therefore, titration to effect is essential. The opioid requirement can be increased as the "stress analgesic response" diminishes. Other important considerations are all drug interactions within the patient and drug compatibilities within the infusions. Refer to Chapter 9 for more detail on sedatives, Chapter 10 (opioids), Chapter 11 (NSAIAAs), Chapter 12 (adjunct analgesia), Chapter 13 (anesthetics) and Chapter 18 (preparation and delivery of analgesics).

The aggressive patient will require a different approach and this is patient- and situation-dependent. Patients may be aggressive upon presentation from pain and fear, or may be aggressive in a strange environment. Animals may appear to be stable when acting aggressively upon admission; however, endorphin and epinephrine release can mask the seriousness of the patient's clinical condition. Chemical restraint rather than force is the humane and often safer way to deal with these animals. Assess the patient from afar and, where time permits, obtain a thorough history, including potential current drug therapy, before selecting a method of restraint. Once the reason for the aggression has been identified, frequently associated with significant pain and fear in traumatized animals, a more direct approach to management can follow. Details and drugs/dosages are given in Chapter 22. Respiratory distress may appear as a combination of panic and aggression; therefore, provide "flow by" oxygen initially as this will relieve some stress. If possible, use an open mask (without the diaphragm) to concentrate oxygen towards the nose of the cat or dog, but without touching the face. As soon as possible following sedation, place two or three drops of ophthalmic local anesthetic drops (e.g. proparacaine) into the entry of the nasal passages, then five minutes later place nasal cannulae (prongs, Figure 1.1) or nasal catheter in the dog. For smaller dogs, use an oxygen cage, if available, immediately following sedation. Cats may be better oxygenated in an induction



Figure 1.1 Placement of nasal cannulae following placement of 2–3 drops of ophthalmic local anesthetic.

chamber, an oxygen hood or a cage; administer an analgesic intramuscular prior to placing in the oxygen rich environment if possible. Refer to Chapter 28 for details.

Of utmost importance to consider is that a continual painful experience is detrimental to the overall well-being and healing process of humans and animals, resulting in prolonged hospital stay, which increases the potential for secondary problems such as hospital-associated infections. Another potential outcome in veterinary patients is euthanasia due to increasing costs. Also of importance is the association between inadequately treated acute pain and the development of chronic pain. This has been reported in human patients occurring after traumatic, surgical and painful medical conditions [2]. While considering all the negative physiological effects associated with the experience of pain, above all, inadequate analgesia resulting in ongoing pain is inhumane.

It is important to question the owner about pre-existing co-morbidities as cardiovascular, hepatic and renal problems will influence the pain and anesthetic management protocol. It is also important to enquire as to pre-existing orthopedic problems (e.g. osteoarthritis of various joints) as careful handling or manipulation of these areas in general, and whilst under general anesthesia for diagnostic purposes, is essential to avoid increasing the degree of pain.

General anesthetics (inhalant, propofol, barbiturates) may be required for surgical or diagnostic procedures for any ill or injured patient and the approach to prevention of pain applies to all. Special considerations for the individual patient are required (refer to Chapter 13 for details and the scenarios in this book for guidance). It is important to note that general anesthetics only block conscious perception of pain for the duration of anesthesia; however, nociceptive input still occurs and will be experienced by the patient upon recovery. Ketamine, however, has anti-hyperalgesic and analgesic properties. The practice of “preventive” analgesia is to reduce the impact of the total peripheral nociceptive barrage associated with noxious pre-, intra- and post-operative or traumatic stimuli [11]. The term “preemptive analgesia” is restricted to analgesic administration prior to the onset of pain, such as in the pre-operative setting with the intention of reducing nociceptive input and potential peri-operative pain. However, this single event of analgesic administration is inadequate to manage post-operative, and frequently intraoperative, pain. Where moderate to severe pain is to be expected, and is frequently associated with injured and some ill patients, one or more classes of analgesics (based on pain severity) with a demonstrated preventive effect should be administered in addition to an opioid. These analgesics (NSAIDs, local anesthetics, N-methyl-D-aspartate (NMDA) antagonists (e.g. ketamine)) not only reduce the inhalant requirement (MAC reduction) and

severity of acute post-surgical pain but may in some cases also reduce the incidence of chronic (persistent) post-operative pain. The efficacy of a multi-modal regimen, combining drugs with pharmacologic action at different sites in the pain pathway, provides optimal analgesia to treating pain, while reducing the dosage of each drug and, therefore, reducing the potential for adverse effects of any single drug that would otherwise require high dosing. Of utmost importance is the utilization of neuraxial analgesia and local blocks wherever possible, both intraoperatively and post-operatively (refer to Chapter 14 for details on the application of all potential techniques for the individual patient). As pain transmission is complex, all nociceptive pathways must be blocked to effect optimal analgesia [15] (refer to Chapter 2). Refer to the pharmacology and clinical application of sedatives (Chapter 9), opioids (Chapter 10) and adjunct analgesia (Chapter 12) for further details.

Illness or injury results in an inflammatory response either local to the area involved or systemically. The presence of inflammation increases the degree of pain experienced following a surgical procedure when compared to that of a routine procedure. As an example, ovariohysterectomy in patients with metritis or pyometra will require higher dosing of analgesics during and after ovariohysterectomy and for longer duration when compared to that of a routine elective procedure. Also, in addition to the potential establishment of chronic pain due to inadequate pain management, inadequately treated pain associated with abdominal or thoracic incisions prevents normal ventilation/oxygenation. Controlled walking and other rehabilitation exercises are essential for post-operative orthopedic repair to ensure appropriate “stress” for bone healing, enhance periosteal blood flow and to maintain muscle mass to support the limb. Without adequate analgesic administration, frequently requiring at least two classes of analgesics, movement will be too painful, resulting in non-use bone and muscle atrophy. Above all, “facilitating pain” to control movement following surgery is unethical. When in hospital, controlled leash walking and integrative techniques (refer to Chapter 15) should be included in the post-operative management protocol, neither of which can be tolerated when in pain. Similar discharge home instructions, with analgesia, must be given.

When considering analgesic selection, the adverse effects must be minimal due to the fragile organ function of these patients. Other important considerations are drug interactions within the patient. Drug metabolism and clearance is primarily via the liver and kidney; where a patient is identified with organ dysfunction, an NSAIA is contraindicated. However, opioid analgesics can still be administered. Initial dosing to effect is required to reach therapeutic levels; however, the dosing intervals may be extended and the hourly infusion rates may be reduced based on patient assessment as the metabolism and excretion may be reduced. The ongoing dosing with adjustments will be dependent on the individual patient. To optimize efficacy and safety, evaluation of cardiovascular, hepatic respiratory and renal systems is essential to guide ongoing pain management. Refer to the appropriate chapters (Chapter 19, cardiovascular; Chapter 20, kidney; and Chapter 21, liver) for information on drug metabolism and excretion, and adjustments in the delivery regimen, for patients with significant organ dysfunction (refer to Chapter 18).

Pregnant (Chapter 23), nursing (Chapter 24) and pediatric (Chapter 25) patients may present with an injury or illness associated with various degree of pain, which must be managed to prevent the consequences noted above. Of importance, is that the newborn and infant animals feel pain and, in fact, have increased sensation when compared to a similar stimulus in an adult. It is extremely important to prevent/treat pain in these patients as permanent hyperalgesia/allodynia may manifest due to the extreme plasticity of the central nervous system in these young animals.

Sedation must not be interpreted as analgesia; therefore, midazolam or dexmedetomidine should only be used as adjuncts in addition to analgesics for stable patients requiring more “restraint” or sedation than the analgesic alone can provide. Refer to Chapter 9 for details.



Figure 1.2 A clean, warm and comfortable environment reduces stress and, therefore, pain.

Of great importance is that analgesia should be withdrawn slowly to avoid an abrupt return to a hyperalgesic state should pain still be present. Where the recurrence of pain is identified, return to the previous dose for several more hours and attempt withdrawal very slowly when appropriate.

Analgesia and sleep is the goal; therefore, it is essential that optimal patient care be provided to avoid further pain (Figure 1.2) and stress. Based on the anxiety and stress our patients experience whilst in the hospital and the detrimental effect this has on their well-being and recovery, it is essential that the nursing care described in Chapter 17, and in all the scenarios presented, is implemented. The requirement for ongoing analgesia is the dual responsibility of the veterinary technician/nurse and the veterinarian and is outlined in Chapter 16. The analgesic/sedative and anesthetic regimen must be tailored to the individual patient according to the problem at hand. See suggestions and recommendations for individual case scenarios throughout this book and review other chapters to optimize analgesic and anesthetic management.

To complete the picture of managing pain in all conditions in small animal practice, consult references [4] and [16].

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