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Post-operative pain assessment in dogs

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ABSTRACT: The development of the Registered Veterinary Nurse's (RVN's) role has progressed greatly within recent years with the establishment of the Veterinary Nurse Charter in February 2015, which enforces and strengthens the profession making RVNs autonomous and self-regulating. With this newly achieved autonomy, RVNs need to provide gold-standard care relative to recent, appropriate literature. An important aspect of this is monitoring pain in post-operative patients. As veterinary professionals there is an ethical and legal obligation to identify and treat pain where required.

Introduction

Dugdale (2012) defined pain as having two aspects: a response to a noxious stimulus that may cause tissue damage and creating a negative individual emotional and subjective experience. Anecdotally, pain used to be seen as a protective mechanism that aided and promoted healing through reduced use or movement of the affected area as described by Hellyer et al. (2007) and Martel, Wideman, and Sullivan (2012). This concept is now deemed detrimental to patient convalescence by Weber, Morton, and Keates (2012) due to prolonged wound healing, prolonged hyperglycaemia, decreased appetite and disrupted sleeping patterns alongside an impaired immune system. These physiological changes are attributed to cortisol release and stimulation of the sympathetic nervous system, which can increase morbidity and mortality in post-operative patients (Bell, 2009; Crompton, 2010). This highlights the importance of assessing pain as a method to assess patient well-being, evaluating current analgesic protocols, and creating patient-specific analgesic plans (Morton, Reid, Scott, Holton, & Nolan, 2005). Ferreira-Valente, Pais-Ribeiro, and Jensen (2011) agreed with this, stating that the main aspect of pain scales should be their ability to detect changes of pain throughout analgesic therapy. As an RVN there is a legal and a moral obligation to ensure patients are pain-free, and this is set out within the Animal Welfare Act 2006 and the Code of Professional Conduct for Veterinary Nurses.

Literature review

The measurement of pain should be objective and the utilisation of pain measurement scales create an environment where the patient results are obtained based on data, making them free from bias. Objective quantification of pain was thought to be achieved by using physiological factors such as tachycardia, tachypnoea, hypertension and pupil dilation alongside behavioural factors such as posturing, restlessness and vocalisation, with the use of a validated scale of measurement to ensure that the results obtained are free from bias (Flaherty, 2009). The most common interpretation of pain by veterinary surgeons (VS) is tachycardia (Williams, 2010); KuKanich (2011) disagreed that using physiological factors alone could lead to misinterpretation due to stress, fear or any medical treatments affecting results obtained. Williams (2010) emphasised the importance of identifying the location, intensity and duration of the pain. This reinforces the need for the use and utilisation of systematic pain assessment.

Hansen (2003) described pain as an experience rather than a quantifiable event which could increase subjectivity into the assessment of post-operative pain. Subjective assessment occurs when the data are obtained from the RVN's intuition, observation and anthropomorphisation of the patient. Hansen (2003) assumed this created bias along with potential discrepancies between inter-observer assessments making the results obtained less reliable. Although

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subjective assessment does hold advantages over objective, as Meagher (2009) explained, it can allow the assessor to view the patient as a whole and evaluate several factors simultaneously. On the other hand, Meagher (2009) believed that it is scientifically flawed to assume animals share identical experiences with humans or animals of different species; this is where discrepancies in pain assessment occur. Flaherty (2012) continued this by highlighting the similarities between physiological pain pathways between humans and animals, but the exact physiological changes in animals are currently unknown.

In human medicine, self-reported pain assessment seems to be the most common and effective means of pain management in cognitively functioning people when compared to recording physiological signs, as they are non-specific to pain intensity or the time scale of pain and can be influenced by external environmental factors (Huguet, Stinson, & McGrath, 2010). Human patients who are unable to communicate their pain such as neonates, the elderly and those with cognitive impairment rely on medical staff, carers and even parents to act as advocates and subjectively assess the patient's pain (Herr, Bjoro, & Decker, 2006). This is comparable to veterinary medicine, as animals do not possess the capability to verbally communicate pain in a way that humans can understand or carry out a self-reporting pain scale. This implies that veterinary staff and the patient's owners are required to act as advocates to assess and voice the animal's suspected pain (Rooney, 2014).

Patient advocates such as VS, RVNs and patient owners all evaluate and assess pain subjectively, prioritising different criteria according to their own personal beliefs, experiences and knowledge of the patient. A study completed by Weber et al. (2012) stated the most sensitive indicator for pain, with the exception of pain scales, was respiratory rate, demeanour and heart rate for the VS; this study was prospective qualitative in nature with a sample size of 50 randomly selected VS. When VS are compared to the RVN, Coleman and Slingsby (2007) showed that the RVNs score patients as more painful than the VS through a qualitative study of 541 participants where this study was compared to results from a previous study in 1999. Rooney (2014) was in agreement with Coleman and Slingsby (2007) and recommended that the RVN should assess behavioural patterns in conjunction with physiological parameters. This discrepancy in monitoring methods can lead to bias and inter-observer variability between members of staff and owners. Meagher (2009) found that observer ratings can be unreliable if aspects used to reach a clinical decision are untested and therefore an invalidated interpretation of pain. Currently to the author's knowledge there is no literature on owner perceptions of pain; this implies that careful phrasing of subjective pain-scoring criteria needs to be taken into consideration while creating a framework for pain assessment to reduce bias and misinterpretation and increase the reliability of their results (Meagher, 2009). Within human medicine, there are numerous subjective pain-assessment scales ranging from specific pain scales for neuropathic or oncological pain, and scales that cater for patients with varying degrees of communication ability and cognitive function (Bennet, Smith, Torrance, & Lee, 2006; Closs, Barr, Briggs, Cash, & Seers, 2004). Some of these subjective pain scales have been adapted for veterinary use along with the development of veterinary-specific scales (Mathews et al., 2015).

Visual Analogue Scale

The Visual Analogue Scale (VAS) is a unidimensional pain scale adapted from human medicine and is displayed as a 100 mm line either horizontally or vertically with specific phrases at each pole highlighting extremes, for example, "No pain" and "Worst possible pain". In human medicine the patient would mark a point along this line, representing their pain, which is measured from zero to the self-reported mark, giving a numerical figure and quantifying their pain (Bahreini, Jalili, & Moradi-Lakeh, 2014). Shields, Cohen, Harbeck-Weber, Powers, and Smith (2003) reported this flexibility as the main benefit of the VAS where a full unrestricted range is available to the patient when describing their pain when compared to the Numerical Rating Scale (NRS). Williamson and Hoggart (2005) are in agreement that this flexibility makes the VAS more sensitive to change; they progressed onto stating difficulties arising from using the VAS, such as alterations to the scale can be made during photocopying, causing distortion of the length to occur, leading to misinterpretation of results. In human studies (Williamson & Hoggart, 2005), the orientation of the scale coincides with the population's normal reading and writing format to aid in improved compliance. Dexterity and cognitive function could also affect results obtained from the VAS; for example, geriatric owners with arthritis, diminished sight and/or dementia can find it difficult to accurately mark their pet's perceived level of pain, which can hinder the reliability of pain evaluation at home or within a clinical setting such as during consultation (Hawker, Mian, Kendzerska, & French, 2011). This freedom of range can also lead to under- or overestimation of pain which can create discrepancies within inter-observer variability when compared to the NRS (Anil, Anil, & Deen, 2002). Mechanical versions are available where a sliding marker represents the intensity of pain experienced (Bijur, Silver, & Gallagher, 2001). Ismail et al. (2015) stated the impracticalities of mechanical VAS in human medicine such as soiling of the scale, time spent cleaning and locating the scale to measure acute pain. As the VAS was deemed a unidimensional pain scale by Smith (2009) meaning it only evaluates the intensity of the painful experience at that moment in time, excluding factors such as stress, drugs or other supportive care, making it reliable in acute pain or if the patient is experiencing pain at the time of measurement. Crompton (2014) describes a modification of the VAS known as the Dynamic and Interactive Visual Analogue scale (DIVA), where the VAS is utilised in several different factors both descriptive and interactive. The patient is examined resting in the kennel and their response to being approached, handled and palpation of the suspected painful area are evaluated by the examiner and a mark is placed on the usual 100 mm line. DIVA would seem to be more multidimensional in its evaluation than its unidimensional VAS counterpart, making it more beneficial by using behavioural and interactive factors (Flaherty, 2012). Controversially, a study by Yazici Sayin and Akyolcu (2014) deemed the VAS unreliable as the sole method of pain assessment when compared to the NRS through a qualitative study into medical staff and patient preference. Their study compared multiple unidimensional pain scales in post-operative humans with a sample size of 621 patients who had no dexterity deficits which could affect the VAS results (Hawker et al., 2011). Correlation was found in all unidimensional pain scales with the exception of the VAS, which was consistently higher; this is supported by Anil et al. (2002). The suggestion from this study was that the VAS should be used in conjunction with other pain scales, such as the NRS or a multidimensional scale.

Teixeira et al. (2013) believed the VAS was comparable to a modified version of

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the Glasgow Composite Measure Pain Scale (CMPS) through a double-blinded prospective study. This study was well thought out as it only asked one specific question, the comparison of ozone therapy to meloxicam for post-operative analgesia. It had minimal researchers participating, one standardised observer carrying out all handling and evaluations, one surgeon and one anaesthetist completing all procedures on the subjects, which increased the reliability of the results (LoBiondo-Wood & Haber, 1998). The sample size for this study was 24 subjects with no subjects removed from the study. Like Moll, Fresno, García, Prandi, and Andaluz (2011), Teixeira et al. (2013) had a control group where no analgesics were given, but in this case, was omitted from the study due to ethical considerations. This raises the question of why the group was ever subjected to a painful procedure just to be omitted from the study and is highly unethical in the author's opinion.

Kalchofner Guerrero et al. (2015) showed the VAS was less sensitive in assessing post-operative pain when compared to the Glasgow Composite Measure Pain Scale Short Form (CMPS-SF) and DIVA. The study was carried out in a similar fashion to Teixeira et al. (2013) and its sample size was relatively small at 23 patients with 20 patients completing the study due to acknowledged exclusions; this sample size is comparable to Teixeira et al. (2013). In both of these studies the patients were allowed to acclimatise to the hospital environment to reduce external factors affecting results. The statistical results from Kalchofner Guerrero et al. (2015) deemed the VAS insensitive to post-operative pain and a good correlation between DIVA and the CMPS-SF, implying that patient interaction is an important factor in pain assessment. That being said, Kalchofner Guerrero et al. (2015) did monitor sedation levels which have been shown to affect results obtained from CMPS-SF (Murrell et al., 2008), but did not provide the results of this monitoring; exclusion of data, especially those which can affect overall results, can cast doubt on the paper's credibility for the reader (LoBiondo-Wood & Haber, 1998).

Numerical Rating Scale

The NRS is another ordinal unidimensional pain scale used in veterinary medicine which is also adapted from human medicine and similar to the VAS. A numerical scale is used varying in size where anchors are applied at either end of the scale representing extremes in pain and a numerical value is given representing pain, similar to the VAS (Hjermstad et al., 2011). In the case of veterinary medicine, the observer allocates a number for the perceived pain of the patient (Crompton, 2014). Application of the NRS is very straightforward, simple to use and does not require specialist training (Williamson & Hoggart, 2005). This ease of use contributes to the frequency of its application in human medicine and is one of the primary forms of unilateral pain assessment in veterinary medicine (Flaherty, 2012; Hjermstad et al., 2011). The NRS has been criticised for being unidimensional and insensitive in assessing pain as it can only measure pain at that precise moment in time (Flaherty, 2012). This is overcome in human medicine by the patient's being able to verbally quantify current pain intensity and compare that to previous pain, as shown in a study carried out by Farrar, Young, LaMoreaux, Werth, and Poole (2001). An alternative application of the NRS can be in a written format or given verbally where there are time constraints, such as in emergency situations in human medicine (Ismail et al., 2015). Another variation of the NRS, as described by Hawker et al. (2011), is where descriptive terms are added to each number, making the NRS a simple descriptive scale; this has the potential for bias to be introduced and to increase inter-observer variability as different phrases can hold different weight depending on the individual. In practice it will not just be one member of veterinary staff assessing these patients, but many individuals who need to evaluate and quantify many behavioural aspects at once depending on their own personal beliefs. One aspect to reduce this is suitable training in the NRS along with a set methodology to assess pain. Ismail et al. (2015) highlighted the advantages of the NRS, both written and verbal formats, as quick to complete with a high compliance rate with no additional tools required when compared to the VAS. Shields et al. (2003) stated that a restriction of the NRS when compared to the VAS is the lack of freedom when evaluating pain where a whole number should be chosen when evaluating pain, although Ismail et al. (2015) disagreed with this and believed that the use of half-point markers can increase the accuracy of pain assessment and correlation between the NRS and VAS. Within the literature surrounding the NRS there seems to be a discrepancy between the uses of scale size. Studies carried out have no justification for their use of scale size, but cite studies with differing scales from their own. An example of this is Sano, King, Seewald, Sakakibara, and Okumura (2012) where a 4-point pain scale was used; this lack of acknowledgement could create scepticism for the readers to the reliability of their results, but no study has shown, to the author's knowledge, a comparison between differing NRS sizes and if there is any correlation between them. The same scale size, 11-point NRS, was used by Wood, Nicholas, Blyth, Asghari, and Gibson (2010) and Moll et al. (2011) to assess pain in their subjects where both authors cited validated NRS variants for their research. The correlation between their results showed that the NRS is suitable for pain assessment and sensitive to detect mild changes of pain in both dogs and elderly humans. The sample size of this study was 24 subjects, which is comparable to other veterinary studies of a similar nature (Kalchofner Guerrero et al., 2015; Teixeira et al., 2013). The study carried out by Moll et al. (2011) created a double-blinded environment for the sole examiner to reduce bias within the study, along with the same handler dealing with all subjects to reduce variability and stress, increasing the reliability of the results obtained (LoBiondo-Wood & Haber, 1998). The study contained a control group that did not receive any analgesia after an invasive surgical procedure with no mention of rescue analgesia; this is abhorrent and raised a great concern of the researcher's ethical standing. Wood et al. (2010) carried out a substantial study with 800 subjects split into three age groups, like Guillot et al. (2011); it had uneven group sizes which could affect results when being compared. Wood et al. (2010) had a single focus when carrying out this study and that was finding the efficacy of the NRS to other pain scales available, aiding in the reliability of results. Scale size has been criticised by Ismail et al. (2015), where smaller NRS scales used, such as a 5-point scale, are more restrictive and prevent the observer from appropriately scoring subtle changes within the patient's pain. Farrar, Portenoy, Berlin, Kinman, and Strom (2000) argued this point by reporting that the application of larger scales, such as 101-point NRS, had discrepancies between points at the lower end of the scale when compared to pain recorded in the middle to high end, making the NRS unreliable in larger scales as the reporter is inclined to select an extreme end of the scale.

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Glasgow Composite Pain Scale

The CMPS is a multidimensional method of assessing pain in dogs developed by Holton, Pawson, Nolan, Reid, and Scott (2001). This scale utilises psychometric principles and was originally an adaptation of the well-established human McGill pain questionnaire (Holton et al., 2001). Holton et al. (2001) collected words and phrases from VS which they thought were linked to dogs in pain along with associated behavioural changes from normal; words and phrases that had related meanings were removed. The observer would select the most appropriate word or phrase in each category and the end result would be an overall figure that would indicate if the patient was painful. Within a simulated setting the results obtained from the CMPS appeared reliable but deemed too lengthy and time-consuming to be fully utilised within a clinical environment (Reid et al., 2007). Before its use in practice, Reid et al. (2007) created and validated a short-form version of the CMPS, the CMPS-SF. This scale differed from the original CMPS, as it contained an intervention level that created a threshold to signify if analgesia was required (Reid et al., 2007). The observer would assess spontaneous behaviour, interactive behaviour and palpation of surrounding suspected 'painful area' such as surgical wounds. The application and comparison of the CMPS-SF to other multidimensional pain scales was carried out by Guillot et al. (2011), where a sample size of 16 subjects underwent bone marrow aspirations of different sites, with or without sedation. The subjects were distributed into three uneven groups which could influence results by making them incomparable, reducing their reliability. Inter-observer variability was a factor here, as even though the study was blinded, two observers were monitoring the patients post-procedure; also the CMPS user was inexperienced with the scale and there was no mention of any training. Unlike Kalchofner Guerrero et al. (2015), Guillot et al. (2011) did not mention a rescue analgesia protocol, leaving the assumption that nothing would be done if the subjects were deemed painful. As previously stated, Kalchofner Guerrero et al. (2015) provided a thoroughly planned study and showed a proficient working knowledge of the CMPS-SF when compared to Guillot et al. (2011) by outlining the intervention levels for both ambulatory and non-ambulatory patients. The results obtained from this study showed the CMPS-SF sensitive for evaluating pain in post-operative dogs with the exception of 0.5 h post anaesthesia, the researcher acknowledged this could have been due to sedation or incomplete recovery from anaesthesia affecting results at that time. Murrell et al. (2008) believed that sedation could modify the results obtained from the CMPS, suggesting that in a clinical setting the patient would need to be fully recovered from all anaesthetic and sedative drugs before an accurate and reliable pain score could be carried out post-operatively; or if the patient becomes sedate post-analgesic therapy the results obtained could be altered.

Conclusion

It is widely accepted in veterinary medicine that animals feel pain and the concept of assessing dogs for pain post-operatively, but the exact mechanisms, emotional and individual response are not fully understood (Flaherty, 2012). This highlighted the need for objective pain assessment tools to remove anthropomorphism and subjectivity when assessing dogs post-operatively for pain and evaluating analgesic efficacy. The means in which this assessment is carried out has led to areas of great debate, where physiological signs such as heart rate, respiratory rate and blood pressure have been proven to be ineffective in assessing pain because of their variability due external factors (Flaherty, 2012). Different pain-assessment tools have been applied to veterinary medicine from human counterparts and specifically veterinary-designed scales, all of which have both favourable and unfavourable characteristics. Both the NRS and VAS are unsuitable for veterinary use as their purpose was self-reported pain in humans, which makes them fundamentally flawed as animals are unable to directly communicate pain by these means. Patient advocates in this setting score the patient on their own personal beliefs as the NRS and VAS do not provide guidance on what aspects of pain they are assessing, creating large inter-observer variability and introducing bias into the clinical setting. The CMPS-SF, currently, is the most effective means of assessing pain in post-operative canines when compared to the VAS and NRS as it is designed specifically for veterinary use and comes with clear and concise criteria to select from, reducing inter-observer variability, along with specific intervention levels, and is proven to be sensitive in assessing post-operative and chronic pain (Guillot et al., 2011; Reid et al., 2007). The CMPS relies on behavioural changes that are known to be related to pain, but like physiological changes, behaviour can also be affected by external factors such as stress, strange environments and drugs.

Recommendation for further study

The assessment of pain in post-operative dogs is still in the early stages of development when compared to human medicine. Further research is required to develop new methods of pain assessment within veterinary medicine as there is currently no evidence-based gold standard of assessment (Meagher, 2009). The methods involved with assessing pain scales have the ethical obstacle of using a group of subjects that have undergone a painful procedure and did not receive analgesics to act as the control is ethically unacceptable. KuKanich (2011) raised the controversial point that this is why the evaluation of pain-assessment methods are flawed as they cannot be fully compared to a control group and the use of 'rescue analgesia' with quick-onset analgesia alongside regular pain assessment could be a method to address this. It is unethical to stimulate a painful response which leaves an animal in a state of pain without providing a means for 'rescue analgesia'.

The attitudes and opinions of RVNs regarding pain assessment tools and their efficacy is an area in which further research could be carried out. To the best of the author's knowledge, only two studies have been carried out regarding this – one focused on VS (Weber et al., 2012) and another focused on RVNs (Coleman & Slingsby 2007). There is a disparity when this is compared to human medicine where there is a vast wealth of knowledge, such as Alm and Norbergh (2013), who discussed the nurse's opinion of pain assessment, their use of pro re nata analgesia and whether non-verbal communication altered the results of an NRS. These results showed that nurse–patient bonds are an important factor that allowed familiarity with the patient and outward appearance of the patients, such as smiling or grimacing can affect their results when compared to self-reporting by the patients. Wikström, Eriksson, Årestedt, Fridlund, and Broström (2014) looked into the healthcare professional's opinions of pain scales and their use in the practical setting. Their overall consensus was that pain scales were useful and gave a greater

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insight into pain, patient trends with regard to analgesia and increased patient–staff bonds, providing better quality care to their patients. Chow and Chan (2015) carried out a literature review regarding nursing students' knowledge and attitudes of pain which showed that the students had a gap in both their knowledge and overall attitude towards pain and pain management. Educators were encouraged to take on an evidence-based approach to their teaching methods to improve their overall knowledge and attitudes. Another area in need of further research is owners' opinions of pain and their use of pain scales – to the best of the author's knowledge, there is currently no literature on this. Research into this field could increase owner compliance in post-operative care at home and increase client–staff bonds.

Recommendation for nursing practice

The control of pain should stand paramount within all aspects of the veterinary profession. All animals are susceptible to pain due to trauma, post-operative and neurological pain or underlying disease processes (Price & Nolan, 2007). It is widely accepted that animals feel pain (Hansen, 2003) and Shaffran (2008) has described pain as the fourth vital sign, meaning it should be incorporated into most if not all clinical exams. This is where the RVN can stand out and improve clinical practice, turning well-developed intuition into a quantifiable figure and improving communication and teaching standards between clinical staff and students. This point is outlined by Bloor (2011), where our actions now must be evidence-based to further develop the profession, expand our knowledge through the development of new veterinary nursing theories and adaptations from our human counterparts, thus encouraging further growth of the profession. One means of this development was the Ability Nursing model created by Orpet and Jeffrey (2007) where the owner completes a questionnaire describing the patient's normal routine and behavioural patterns, allowing the RVN to know what its 'normal' for their patient and identifying abnormalities which could indicate the need and integration of a pain scale. Bell (2009) stated that pain management and assessment should be a dynamic process where analgesics are titrated to effect instead of administering set doses. Pain assessment could be as simple as administering analgesics and monitoring for a positive result, such as resuming normal behavioural patterns.

References

Alm, A. K., & Norbergh, K.-G. (2013). Nurses. Opinions of pain and the assessed need for pain medication for the elderly. *Pain Management Nursing, 14*, e31–e38.

Anil, S. S., Anil, L., & Deen, J. (2002). Challenges of pain assessment in domestic animals. *Journal of the American Veterinary Medical Association, 220*, 313–319.

Bahreini, M., Jalili, M., & Moradi-Lakeh, M. (2014). A comparison of three self-report pain scales in adults with acute pain. *The Journal of Emergency Medicine, 48*, 10–18.

Bell, A. (2009). Constant-rate infusions: Part one. *Veterinary Times*, No. 18, pp. 30–32.

Bennet, M. L., Smith, B. H., Torrance, N., & Lee, A. J. (2006). Can pain be more or less neuropathic? Comparison of symptom assessment tools with ratings of certainty by clinicians. *Pain, 122*, 289–294.

Bijur, P. E., Silver, W., & Gallagher, E. J. (2001). Reliability of the visual analog scale for measurement of acute pain. *Academic Emergency Medicine, 8*, 1153–1157.

Bloor, C. (2011). Research methodology for veterinary nurses. *The Veterinary Nurse, 2*, 288–294.

Chow, K. M., & Chan, J. C. Y. (2015). Pain knowledge and attitudes of nursing students: A literature review. *Nurse Education Today, 35*, 366–372.

Closs, S. J., Barr, B., Briggs, M., Cash, K., & Seers, K. (2004). A comparison of five pain assessment scales for nursing home residents with varying degrees of cognitive impairment. *Journal of Pain and Symptom Management, 27*, 196–205.

Coleman, D. L., & Slingsby, L. S. (2007). Attitudes of veterinary nurses to the assessment of pain and the use of pain scales. *Veterinary Record, 160*, 541–544.

Crompton, S. (2010). Pain assessment and pain scoring models: A review. *The Veterinary Nurse, 1*, 22–27.

Crompton, S. (2014). Reviewing pain assessment and scoring models in cats and dogs – Part one. *Veterinary Nurse Times.* Retrieved December 2, 2015, from http://www.vettimes.co.uk/article/reviewing-pain-assessment-and-scoring-models-in-cats-and-dogs-part-one/

Dugdale, A. (Ed.). (2012). Pain. In *Veterinary anaesthesia principles to practice*. Oxford: Wiley-Blackwell.

Farrar, J. T., Portenoy, R. K., Berlin, J. A., Kinman, J. L., & Strom, B. L. (2000). Defining the clinically important difference in pain outcome measures. *Pain, 88*, 287–294.

Farrar, J. T., Young, J. P., Jr, LaMoreaux, L., Werth, J. L., & Poole, M. R. (2001). Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. *Pain, 94*, 149–158.

Ferreira-Valente, M. A., Pais-Ribeiro, J. L., & Jensen, M. P. (2011). Validity of four pain intensity rating scales. *Pain, 152*, 2399–2404.

Flaherty, D. (2009). Analgesia. In L. Welsh (Ed.), *Anaesthesia for veterinary nurses*. Oxford: Wiley-Blackwell.

Flaherty, D. (2012). Pain assessment in dogs and cats. In *Southern European Veterinary Conference*. New York, NY: International Veterinary Information Service.

Guillot, M., Rialland, P., Nadeau, M.-È., del Castillo, J. R. E., Gauvin, D., & Troncy, E. (2011). Pain induced by a minor medical procedure (bone marrow aspiration) in dogs: Comparison of pain scales in a pilot study. *Journal of Veterinary Internal Medicine, 25*, 1050–1056.

Hansen, B. D. (2003). Assessment of pain in dogs: Veterinary clinical studies. *Veterinary Clinical Studies Ilar Journal, 44*, 197–205.

Hawker, G. A., Mian, S., Kendzerska, T., & French, M. (2011). Measures of adult pain: Visual analog scale for pain (VAS pain), numeric rating scale for pain (NRS pain), McGill pain questionnaire (MPQ), short-form McGill pain questionnaire (SF-MPQ), chronic pain grade scale (CPGS), short form-36 bodily pain scale (SF). *Arthritis Care Research, 63*, S240–S252.

Hellyer, P., Rodan, I., Brunt, J., Downing, R., Hagedorn, J. E., & Robertson, S. A. (2007). AAHA/AAFP pain management guidelines for dogs and cats. *Journal of Feline Medicine and Surgery, 9*, 466–480.

Herr, K., Bjoro, K., & Decker, S. (2006). Tools for assessment of pain in nonverbal older adults with dementia: A state-of-the-science review. *Journal of Pain and Symptom Management, 31*, 170–192.

Hjermstad, M. J., Fayers, P. M., Haugen, D. F., Caraceni, A., Hanks, G. W., Loge, J. H., … Kaasa, S. (2011). Studies comparing numerical rating scales, verbal rating scales, and visual analogue scales for assessment of pain intensity in adults: A systematic literature review. *Journal of Pain and Symptom Management, 41*, 1073–1093.

Holton, L., Pawson, P., Nolan, A., Reid, J., & Scott, E. M. (2001). Development of a behaviour-based scale to measure acute pain in dogs. *Veterinary Record, 148*, 525–531.

Huguet, A., Stinson, J., & McGrath, P. J. (2010). Measurement of self-reported pain intensity in children and adolescents. *Journal of Psychosomatic Research, 68*, 329–336.

Ismail, A. K., Abdul Ghafar, M. A., Shamsuddin, N. S. A., Roslan, N. A., Kaharuddin, H., & Nik Muhamad, N. A. N. (2015). The assessment of acute pain in pre-hospital care using verbal numerical rating and visual analogue scales. *The Journal of Emergency Medicine, 49*, 287–293.

Kalchofner Guerrero, K. S., Schwarz, A., Wuhrmann, R., Feldmann, S., Hartnack, S., & Bettschart-Wolfensberger, R. (2015). Comparison of a new metamizole formulation and carprofen for extended post-operative analgesia in dogs undergoing ovariohysterectomy. *The Veterinary Journal, 204*, 99–104.

KuKanich, B. (2011). Analgesia and pain assessment in veterinary research and clinical trials. *The Veterinary Journal, 188*(1), 1–2.

LoBiondo-Wood, G., & Haber, J. (1998). *Nursing research methods, critical appraisal, and utilization* (4th ed.). St. Louis, MO: Mosby.

Mathews, K., Kronen, P. W., Lascelles, D., Nolan, A., Roberston, S., Steagall, P. V. M., Wright, B., & Yamashita, K. (2015) Guidelines for recognition assessment and treatment of pain. *The Veterinary Nurse, 6*, 164–173.

Martel, M. O., Wideman, T. H., & Sullivan, M. J. L. (2012). Patients who display protective pain behaviours are viewed as less likable, less dependable and less likely to return to work. *Pain, 153*, 834–849.

Meagher, R. K. (2009). Observer ratings: Validity and value as a tool for animal welfare research. *Applied Animal Behaviour Science, 119*(1–2), 1–14.

Moll, X., Fresno, L., García, F., Prandi, D., & Andaluz, A. (2011). Comparison of subcutaneous and transdermal administration of buprenorphine for pre-emptive analgesia in dogs undergoing elective ovariohysterectomy. *The Veterinary Journal, 187*, 124–128.

Morton, C. M., Reid, J., Scott, E. M., Holton, L. L., & Nolan, A. M. (2005). Application of a scaling model to establish and validate an interval level pain scale for assessment of acute pain in dogs. *American Journal of Veterinary Research, 66*, 2154–2166.

Murrell, J. C., Psatha, E. P., Scott, E. M., Reid, J., & Hellebrekers, L. J. (2008). Application of a modified form of the Glasgow pain scale in a veterinary teaching centre in the Netherlands. *The Veterinary Record, 162*, 403-408.

Orpet, H., & Jeffrey, A. (2007). *Implementing the ability model.* Retrieved February 14, 2014, from http://www.myftraining.com/Docs/Care%20Plan%20%20Using%20the%20Ability%20Model.pdf

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Price, J., & Nolan, A. (2007). The physiology and pathophysiology of pain. In C. Seymour & T. Duke-Novakovski (Eds.), *BSAVA manual of canine and feline anaesthesia and analgesia* (2nd ed.). Gloucester: BSAVA pp. 79-88.

RCVS. (2015). *Veterinary nurse charter*. Retrieved September 12, 2015, from http://www.rcvs.org.uk/registration/about-the-vn-register/royal-charter-faq/

Reid, J., Nolan, A. M., Hughes, J. M. L., Lascelles, D., Pawson, P., & Scott, E. M. (2007). Development of the short-form Glasgow composite measure pain scale (CMPS-SF) and derivation of an analgesic intervention score. *Animal Welfare, 16(s)*, 97–104.

Rooney, H. (2014). Identification, diagnosis and management of pain in pets. *Veterinary Nurse Times*, No. 3, pp. 12–15.

Sano, T., King, J. N., Seewald, W., Sakakibara, N., & Okumura, M. (2012). Comparison of oral robenacoxib and ketoprofen for the treatment of acute pain and inflammation associated with musculoskeletal disorders in cats: A randomised clinical trial. *The Veterinary Journal, 193*, 397–403.

Yazici Sayin, Y., & Akyolcu, N. (2014). Comparison of pain scale preferences and pain intensity according to pain scales among Turkish patients: A descriptive study. *Pain Management Nursing, 15*, 156–164.

Shaffran, N. (2008). Pain management: The veterinary technician's perspective. *Veterinary Clinics of North America: Small Animal Practice, 38*, 1415–1428.

Shields, B. J., Cohen, D. M., Harbeck-Weber, C., Powers, J. D., & Smith, G. A. (2003). Pediatric pain measurement using a visual analogue scale: A comparison of two teaching methods. *Clinical Pediatrics, 42*, 227–234.

Smith, L. J. (2009). Pain models: Companion animals. In *American Academy of Veterinary Pharmacology and Therapeutics Biennial Symposium Proceedings*. MD: American Academy of Veterinary Pharmacology and Therapeutics, Rockville, MD, USA.

Teixeira, L. R., Luna, S. P. L., Taffarel, M. O., Lima, A. F. M., Sousa, N. R., Joaquim, J. G. F., & Freitas, P. M. C. (2013). Comparison of intrarectal ozone, ozone administered in acupoints and meloxicam for postoperative analgesia in bitches undergoing ovariohysterectomy. *The Veterinary Journal, 197*, 794–799.

Weber, G. H., Morton, J. M., & Keates, H. (2012). Postoperative pain and perioperative analgesic administration in dogs: Practices, attitudes and beliefs of Queensland veterinarians. *Australian Veterinary Journal, 90*, 186–193.

Wikström, L., Eriksson, K., Årestedt, K., Fridlund, B., & Broström, A. (2014). Healthcare professionals' perceptions of the use of pain scales in postoperative pain assessments. *Applied Nursing Research, 27*, 53–58.

Williams, J. (2010). Pain assessment part two: Designing pain scales. *Veterinary Nurse Times*, No. 10, pp. 22–23.

Williamson, A., & Hoggart, B. (2005). Pain: A review of three commonly used pain rating scales. *Journal of Clinical Nursing, 14*, 798–804.

Wood, B. M., Nicholas, M. K., Blyth, F., Asghari, A., & Gibson, S. (2010). Assessing pain in older people with persistent pain: The NRS is valid but only provides part of the picture. *The Journal of Pain, 11*, 1259–1266.

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