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Robyn is a Registered Veterinary Nurse who qualified with a degree from Myerscough School of Veterinary Nursing in 2016 and gained her higher education diploma in clinical veterinary nursing in 2021 in surgery, medicine and anaesthesia. She is completing her RCVS accredited Diploma in Advanced Veterinary Nursing currently. Robyn has worked on a volunteer basis with animals since she was four and her passion for this profession has only grown since then. She spent years of her life at the Horse and Pony Protection Association (HAPPA) and later at a local rescue and rehabilitation yard. Here she met a veterinary surgeon who inspired her, and Robyn went for her first work experience in 2008 at the busy mixed practice where they worked. She has also traveled to Thailand to use her knowledge and skills working with elephants, horses, goats, pigs, water buffalo, cats, and dogs. She has volunteered with Street Paws, who help provide veterinary care for homeless people's beloved dogs too. She currently has a role within Canine Arthritis Management and has a passion and keen interest in the condition. Email: robynblythe@btinternet.com

The Registered Veterinary Nurses role in canine osteoarthritis management

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ABSTRACT: Canine Osteoarthritis (OA) is one of the most commonly encountered musculoskeletal disorders and one that Vets (VS) and Registered Veterinary Nurses (RVN) are likely to see in day to day general practice. Involvement of a RVN can help bond the client to the practice, aid in increased compliance with an evidence based multi modal management plan, help educate on evidence based medicine and support and guide the client through the treatment. Ultimately this can lead to better quality of life for our patients and avoid clients falling foul of bogus techniques or products.

Keywords: Canine Arthritis; Osteoarthritis; RVN and Arthritis

Canine Osteoarthritis (OA) is one of the most commonly encountered musculoskeletal disorders and one that veterinary surgeons (VS) and Registered Veterinary Nurses (RVN) are likely to see in day to day general practice.

OA is sadly incurable, and can result in a complex pain state involving both nociceptive and neuropathic mechanisms. It is often debilitating and stressful for both the patient and the owner; with negative consequences related to pain, mobility and decreased quality of life.

Treatment of OA should ideally be multimodal with aims to alleviate the painful clinical signs associated with the condition. The VS is likely to prescribe analgesia such as NSAIDs and may use a polypharmacy approach using other forms of medical therapy following diagnosis of the condition.

Kerb-side appointments due to the pandemic have added to the challenges of veterinary medicine. Although a return to more normal consultations seems ever more possible, it is clear that the burden on veterinary practices remains high. To ensure that clients are being supported in a comprehensive way RVNs can and should, to their competencies, be utilised to provide an excellent and thorough service for clients and patients with complex medical issues

such as OA. RVNs can excel in support and advice helping to educate which may aid in client understanding and therefore compliance.

As RVNs it is important to remember that pain is a subjective experience, unique to each individual, and will affect both patient and owner in many aspects of daily life. Therefore, tailored, multimodal management strategies are required. These can include discussion and improvements in strategies concerning weight management, home adaptations, exercise modification, dietary support, physical rehabilitation, anti-inflammatory drugs, additional analgesics and even complementary therapy should the owner wish to use alongside traditional medical therapy. Although surgery and regenerative therapy may also need to be utilised, this article will focus mainly on what an RVN can do in order to help maximise management of OA.

Many VS (and RVNs) are pressurised under time constraints of consultations and balancing busy diaries. It is therefore of great benefit to both VS (who can delegate and refer) and to the owners and patients diagnosed with OA that RVNs are able to offer a more thorough and tailored clinic that aims to support and guide owners through the minefield that is an OA diagnosis.

So what would these clinics include?

When conducting an OA clinic, I like to initially go back to the basics allowing a well rounded and holistic view of the dog's current routine and lifestyle.

- Behaviour – When did the owner notice a change in their pet? Bear in mind that many owners disregard OA symptoms as “slowing down” or “old age” and this will need to be investigated to get a true understanding on the extent of the duration of symptoms. Did the diagnosis come as a shock or had the owner brought the dog in for the purpose of lameness and OA concerns? Has the dog's wake/sleep cycle changed? Are they licking any particular area? Are they more anxious or fear aggressive? Have they developed any new phobias? Are they less tolerant? Are they not playing like they used to?
- Posture change – Has the owner noticed a change in posture and gait. Are you noticing a hunched back appearance? Is the dog shifting weight when standing? Do they sit down differently? Do they heave themselves up after a period of rest?
- Perception – What is the owners perception of the problem and what would their long term goal of treatment be? It is important at this stage to manage expectations of their pets health if a full return to “normal” is unrealistic. Do they understand the condition is life long?
- Diet – What is the pet eating? This leads nicely to BCS and weight management. Is the pet a good BCS, is it over weight, what is its muscle condition like?
- Environment and Home – Does the home environment need any changes to improve management? Have they got slippery flooring? Big steps? What bed are they providing? Does the dog down from the car boot? Is there anything that can be done in the home to prevent further injury and deterioration of the joint?
- Exercise – How much exercise, how consistent, how long and what terrain? What effect does the exercise have on the dog? Are we using repetitive ball flingers or Frisbees that could result in a repetitive strain injury?

Once you have spent some time information gathering, you will then be able to focus your efforts on the areas in need of improvement, and areas where guidance is needed to improve management and therefore quality of life.

Realistically this section could be done via email, questionnaire or over the phone, over the phone being my preference. Schedule at a time when the owner is free to chat and feels able to discuss the case without distraction.

Diet and weight management

Over 60% of veterinary surgeons (VS) say obesity is the biggest health and welfare concern for UK pets (Figure 1), according to figures released by BVA on World Obesity Day (BVA, 2016). It has been suggested that nearly 56% of dogs are overweight according to the Association for Pet Obesity Prevention (APOP, 2019). Weight management is hugely important in the management of OA, with an obese or overweight animal putting themselves under considerably more strain than necessary. Perry (2019) cites a number of studies that have shown that weight loss has been reported to significantly decrease the severity of hind limb lameness, reduce the prevalence and severity of OA and improve patient mobility.

It is therefore of great importance that if an animal is overweight, with a BCS of six or more (from the 1–9 BCS scale), that some kind of weight management protocol is put into place using a good quality, complete diet.

Adipose tissue can act as a rich source of pro-inflammatory mediators; in obese dogs with OA the extent and frequency of lameness seen is closely correlated to body condition. This is thought to be due to adipocytes producing higher numbers of cell-signalling factors, increasing inflammation and causing a further deterioration in the underlying pathology of the joint (Skeldon, 2018). Supporting and guiding weight loss is therefore imperative and something that may take up a significant amount of time in some OA consults. However it is extremely important not to overlook as it has been shown that a reduction in bodyweight by 6% to 8% can significantly improve limb function; this is confirmed by one study in dogs that demonstrated preventing obesity delayed the onset of OA and reduced its severity (Skeldon, 2018). The WSAVA and Royal Canin (Figure 2 and 3) both provide excellent 1–9 BCSs that can be utilised.

<https://wsava.org/wp-content/uploads/2020/01/Body-Condition-Score-Dog.pdf>

Muscle condition scoring

Dogs suffering from OA can undergo atrophy of certain muscle groups and their offload pressure to avoid discomfort. Alongside body condition scoring, muscle condition scoring can also be of great importance and usefulness in assessing the

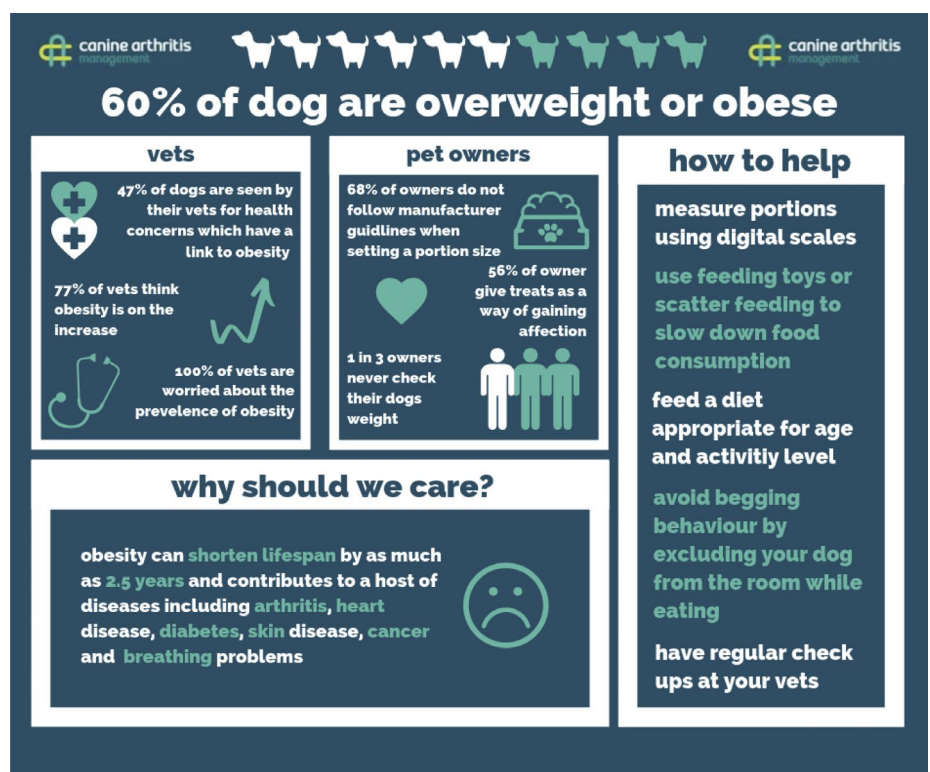


Figure 1. Canine Arthritis Management poster.

**BODY CONDITION SCORE
MEDIUM DOG**

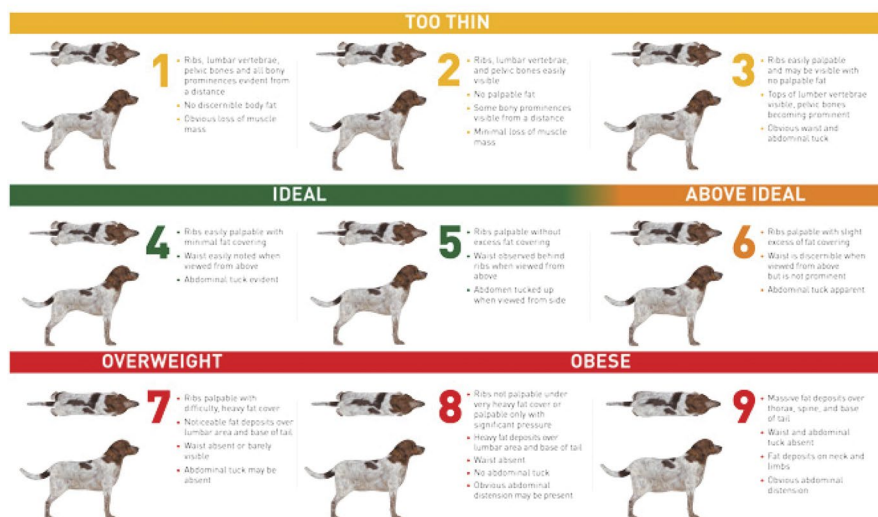


Figure 2. Royal Canin Body Condition Score for a medium dog (Royal Canin, 2019).

work out is the delicate balance between too much and not enough! The general consensus is that exercise should be consistent and appropriate to both provide mental stimulation and socialisation for the patient, while not exacerbating clinical signs. Regular, moderate exercise in humans has been shown to reduce the clinical signs of OA (Skeldon, 2018). Providing an exercise plan that is tailored to the patient is important; excessive ball throwing, rough play, isolated long walks on uneven terrain and even extreme weather conditions should be avoided. Reinforcing this view, a study in dogs reported excessive exercise increased lameness in dogs with OA (Beraud et al., 2010).

The Liverpool University “LOAD Score” has questions that can really lead your consult that can highlight what your individual patients struggle with the most (University of Liverpool, 2019). This can include getting up after exercising, effect of weather (cold and wet) on the pet’s OA, length and terrain of walks and if the exercise is concentrated on certain days causing “flare ups” in the subsequent days. Owners will also need to be made aware that OA is an extremely changeable disease, and that they must be flexible with their exercise should the pet be experiencing a particularly bad flare up of clinical signs.



Figure 3. WSAVA Body Condition Score (WSAVA, 2019).

effects of OA and subsequent improvement (Figure 4). Muscle sensorimotor dysfunction (muscle weakness, increased fatigability of muscle and proprioceptive deficits) has been implicated in the pathogenesis of OA, by impairing neuromuscular protective mechanisms that prevent harmful abnormal joint movement, damage, and pain (Hurtley, 2002). This can therefore lead to further instability and deterioration of the joint. Animals compensating for OA pain with gait change will likely experience some kind of muscle atrophy. Noting these areas and even measuring them can help in follow up

clinics to assess if the patient is weight bearing better and building muscle in the correct areas.

Exercise

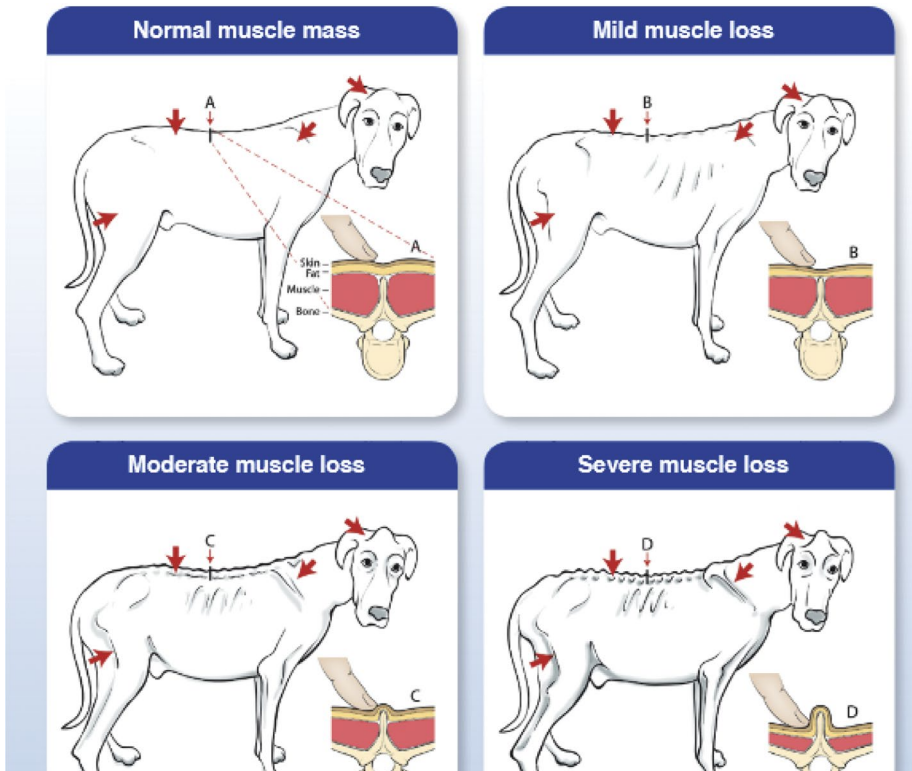
Exercise is generally very important for both owners and for the pets, with mental stimulation and maintaining muscle mass both contributing to the management of OA and increased quality of life. Recommendations on exercise regimes for OA dogs are very difficult as the effect of exercise advice can vary between individuals. What you have to

Medical therapy

Following diagnosis of OA it is not uncommon for a VS to prescribe a medication and send a patient and owner on their way trusting the medication will be given as prescribed. However with an increasing trend for alternative therapies, fear mongering and misinformation online and sometimes misguided distrust of conventional medicine, having an RVN take the time to explain the drug therapy including safety can help with owner compliance.

Considerations include; is the owner following the dosing instructions accurately? Is the owner giving the medication as frequently as prescribed? Have there been any missed doses? Is the owner having difficulties administering the medication resulting in poor compliance? Do they think their pet is responding to the medication (Do they have a realistic view on what their pet should act like following medication? e.g. we may not be able to fully alleviate all symptoms, or it may take time)? Have they noticed any side effects or changes since starting the medication?

As an RVN we are in a great position to help educate and spend time with an owner,



▲ Figure 4. Muscle Condition Score.

“Often people seem to have a **misconception** that **supplements** are appropriate as a **replacement** for **conventional analgesic medication.**”
 -robyn lowe

canine arthritis management

asking questions that could lead to insight into whether the medical therapy prescribed is suitable for that owner and patient. If the RVN has any concerns or suggestions then this can be raised with the prescribing VS who may be able to prescribe a more appropriate medical therapy that could ultimately lead to increased compliance and better quality of life.

RVNs are also in a strong position to help educate on supplements and other therapies or interventions that the owner may be considering after reading about them on, often unregulated, forums. Many of these internet pages contain a number of extremely passionate but often misguided individuals that drum up fear and mistrust of vets and medications, promoting “natural” remedies. Unfortunately at present time, these

remedies often lack a strong evidence base to support their use. This could ultimately lead to lack of owner compliance if they decide to stop using veterinary prescribed medications, instead choosing a more “natural” route. Unfortunately, in many cases this could lead to poor quality of life as the patient does not receive the care it needs to alleviate pain. Educating owners therefore will allow greater understanding of which therapies do or do not have a good evidence base, and will direct finances to therapies that have a greater chance of improving quality of life in arthritic patients.

Home adaptations

Things that owners may not think about are adaptations to the home. Slipping on floors, large steps in and out the house and stairs can all cause micro traumas that can exacerbate OA symptoms and cause further degeneration of the joint. Repeated slips or tripping over, no matter how small, will progress the clinical signs of OA. Canine Arthritis Management (CAM, 2019a) have a fantastic home adaptations tool, called “It’s my home too,” this can be sent home with the owner or filled out during a consult. Not only does it highlight areas of interest but also gives suggestions on how to make the home changes. Installing ramps to avoid steps or help the patient getting into a car rather than jumping in and out of high boots, and using rubber matting or carpets/runners on slippery floors and moving

obstacles can help improve the patient’s mobility and comfort at home (Hutchinson, 2018).

Complementary/additional therapies

Some owners with OA dogs will likely want to utilise all avenues in the management of the disease. OA patients do greatly benefit from a multimodal approach, with medical therapy being paired with physical techniques. Complementary medicine has become more popular worldwide. Some have fantastic emerging evidence for their use. It should be noted that in some of the therapies, but not all, few controlled studies have been conducted in animals and, therefore, evidence to support the use and success of some of these treatments is largely anecdotal or extrapolated from trials in humans (Le Bars, 2008).

There is an extremely diverse range of complementary therapies available for example, acupuncture, laser therapy and massage techniques. Some, such as acupuncture must be carried out by a VS, however the majority can be carried out by both qualified and unqualified individuals. This is when it is important to scrutinise the service offered to ensure the therapist working on the animal has appropriate knowledge and qualifications to be providing such a service. Some therapies have sounder evidence base than others and this needs to be taken into account when thinking about discussion, referral and directing finances to appropriate, evidence based therapies.

Acupuncture

Veterinary acupuncture focuses on the neurophysiologically modulating effects of inserting an acupuncture needle. Acupuncture is supposed to elicit a number of responses, including the release of endorphins, serotonin and enkephalins (which alter pain processing pathway), and local changes within the spinal cord and nerves, which may result in the relief of pain and muscle spasticity (Le Bars, 2008). Acupuncture can be considered as an additional form of pain control, though the response between animals and conditions seems variable (Hubbard, 2017). We are seeing more positive evidence emerge regarding the use of acupuncture in dogs and encourage further study. The ABVA (2020) state

“pain is one of the most common indications for acupuncture. Chronic pain

cases in particular can gain huge benefits from the inclusion of acupuncture into their management regime. Acupuncture is also a really valuable option for those pets that may be limited in medical options due to concurrent disease processes."

For example, one study looked into acupuncture and manual therapy and concluded

"in summary, there appears to be good support for the hypothesis that one or two sessions of combined acupuncture and manual therapy provides immediate short-term improvement in dogs' comfort and mobility, as demonstrated by owner observed changes in play behaviour, walking, trotting, jumping, descending stairs, rising from a lying position, and stiffness after rest or following exercise. VSs now have more information on which to form an evidence-based opinion on the value of CAMT" (Lane & Hill, 2016).

This study however focussed on subjective data, so we would encourage more objective studies in the future.

Although insertion of beads at acupoints is not common in the UK, Koh (2020) stated that in two controlled studies in dogs with hip dysplasia, a gold bead implanted at acupoints significantly reduced osteoarthritic pain. Acupoints are specifically chosen sites of acupuncture manipulation. Stimulating different acupoints on the body surface has been suggested to provide various therapeutic benefits (Li et al., 2015). A 2-year follow-up study revealed that gold-bead acupuncture provided long-term pain relief, an effect not observed in dogs receiving placebo. Koh concluded that

"given the low risk for adverse effects and observed benefits for acute and chronic pain, acupuncture can play a large role in pain management and can be incorporated into veterinary practice as part of a multimodal approach."

In some studies not relating to osteoarthritis, on thoracolumbar intervertebral disc herniation the group that received electro-acupuncture and acupuncture had more prevalent ambulation recovery, and back pain relief time was shorter than in the other groups (Han et al., 2010). In another study peri-operative opioid requirements were lower following an ovariohysterectomy following electro stimuli at acupoints (Cassu et al., 2012). In a study relating to muscle injuries,

the study concluded that acupuncture had a positive stimulatory effect on muscle tissue formation resulting in faster remodelling and muscle healing (Sharifi et al., 2004). This was also seen in a study regarding fracture healing that illustrated acupuncture had a positive stimulatory effect on callus formation and concluded that it is "quite effective" (Sharifi et al., 2003).

These studies could highlight the analgesic and healing effects that may be transferable to OA cases however further investigations are encouraged. Acupuncture can only be performed on animals in the UK by a qualified veterinary surgeon who is a practising member of the Royal College of Veterinary Surgeons. On occasion, needles may be placed by a RVN as a Schedule 3 procedure, but this RVN must be under the direct supervision of an appropriately trained VS (ABVA, 2021). Encouragingly, this means that medical therapy can continue to be prescribed and monitored alongside complementary therapy, rather than the owner finding alternative unqualified therapists that may discourage pharmaceutical approaches.

Laser therapy

Photobiomodulation, also known as low-level laser therapy, is the therapeutic use of monochromatic light. Red and near-infrared light is used to stimulate cellular function for beneficial clinical effects for example reduce inflammation and pain relief (Mancinelli, 2016). Evidence exists that laser treatment could provide analgesia effects; clinically this manifests as improved vascularisation to the treated site, increasing the body's natural tissue healing process, and anti-inflammatory and analgesic effect (Mancinelli, 2016).

Dycus (2020) discussed that the anti-inflammatory effects of laser therapy can be considered. Dycus stated that in a rat osteoarthritis (OA) model, laser therapy reduced oedema within the joint by 23%, decreased vascular permeability in the peri-articular tissue by 24%, and decreased pain by 59%. Furthermore, some subjective studies in humans with OA have shown improved quality of life, reduced pain, and increased analgesic and microcirculatory effects. However, there is a lot of conflicting evidence available, it has been discussed that individual results may depend on, type and extent of disease, wavelength, method of application, dosage, site and duration of treatment. This is also confirmed by McKenzie (2018) who stated that "some positive effects have been reported, but no consistent pattern of clinical benefit has yet emerged."

Massage therapy

Massage is an extraordinarily diverse treatment option, with skill base ranging from low to highly qualified. Although massage may be an excellent supplementation to an OA patient's plan, it is imperative that we chose adequately trained individuals who work synergistically with veterinary practices and are adequately trained and qualified. Done incorrectly massage could be deeply uncomfortable and even cause injury to a patient. Formenton et al. (2017) discussed massage therapy as having clear clinical benefits; however despite strong evidence of close correlation between human and animal therapy, animal-specific mechanisms of action and physiologic responses have not been described. Massage therapy is thought to induce systemic effects via different biochemical, mechanical, physiological, and even psychological pathways.

Formenton et al. (2017) stated that massage therapy has no direct effect on joints or specific orthopaedic conditions such as OA. Massage techniques may have an indirect impact on primary articular conditions, contributing to patient improvement and return to function due to the contracture and spasticity of related muscles leading to decreased range of motion and articular functional compromise which correct massage technique may alleviate.

Formenton et al. (2017) highlighted a systematic review of studies comparing human patients suffering from musculoskeletal conditions who were referred to massage therapy suggested that treatment with massage therapy alone promotes pain relief and functional recovery. This could potentially be extrapolated to canine OA as we are aware that the pathways are remarkable similar between canine and human OA.

Physiotherapy and hydrotherapy

When advising physiotherapy or hydrotherapy, it may be prudent to support referral to skilled, experienced and qualified paraprofessionals as it requires extensive knowledge and understanding in order to avoid further damage or exacerbation of OA.

Physiotherapy can improve weight bearing, comfort and mobility in dogs with OA and other joint problems, and many owners report improvements. Hydrotherapy, in coordination with physiotherapy, can provide benefits also, as well as

providing secondary effects in weight loss (if required), musculature building/maintenance, mental stimulation and exercise that is low impact. These are areas that as an RVN you can discuss, and can facilitate with the referral from the case VS if they deem it appropriate.

Cartlidge (2015) after reviewing the human and canine literature conclude that hydrotherapy has the potential to be highly beneficial to patients suffering with OA. Cartlidge (2014) also stated that physiotherapy/therapeutic exercise can result in strengthening muscles, encouraging weight bearing, improving range of motion and improving balance and proprioception. All of which could be immensely beneficial in an arthritic patient.



Complementary therapy conclusion

As with any complementary therapy it is important to remember, as agreed by CAM (2019b), that complementary therapy should be used alongside conventional treatment as part of a multimodal approach. CAM (2019b) does advocate combining recognised, well regulated, professional complementary therapies with mainstream interventions. It can therefore be something that is included in a discussion in an Arthritis clinic with an RVN and allows for further support and education of the client, to allow them to make more informed decisions about which therapies are most likely benefit their pet.

Conclusion

Clearly as RVNs there is a huge amount of scope for improving OA management and helping and guiding owners in decision making in the management of OA. As such, we should also be encouraged to charge appropriately for the time, knowledge, resources and expertise from a registered veterinary professional.

OA is a changeable, life changing disease process and as such owners will greatly benefit from guidance from a medically trained professional, such as an RVN, who takes the time to explain, educate and guide them through the minefield that is multimodal OA treatment. This will avoid any confusion and poor choices brought about by owners using unregulated, non-medically trained internet forums as a source for information because they feel they have not been supported by the veterinary team. Although they can be time consuming they are a great way to create good client rapport, increase owner and employee satisfaction, educate owners and help improve quality of life for arthritic dogs. If we can try to integrate these into our consulting diary we may be able to successfully guide an owner through a very difficult disease, to help them make informed choices, and not fall foul of bogus products.

Further reading

Lowe, R. (2020). Evidence for the use of supplements in canine arthritis management. *Veterinary Nursing Journal*, 35(9–12), 354–358. <https://doi.org/10.1080/17415349.2020.1795028>

References

ABVA. (2020). *How can my patient benefit from acupuncture.* <https://www.abva.co.uk/vet-area/how-can-my-patients-benefit-from-acupuncture/>

ABVA. (2021). *Referring a case for acupuncture.* <https://www.abva.co.uk/vet-area/referring-a-case-for-acupuncture/>

APOP. (2019). *US pet obesity rates plateau and nutritional confusion grows.* <https://ernie-ward-gxwk.squarespace.com/2018>

Beraud, R., Moreau, M., & Lussier, B. (2010). Effect of exercise on kinetic gait analysis of dogs afflicted by osteoarthritis. *Veterinary and Comparative Orthopaedics and Traumatology*, 23(2), 87–92. <https://doi.org/10.3415/VCOT-09-06-0068>

BVA. (2016). *Pet obesity epidemic is top welfare concern for vets.* <https://www.bva.co.uk/news-and-blog/news-article/pet-obesity-epidemic-is-top-welfare-concern-for-vets/>

Canine Arthritis Management (CAM). (2019a). *It's my home too.* Available from: <https://caninearthritis.co.uk/wp-content/uploads/2018/07/CAM-Home-Assessment-Checklist.pdf>

CAM. (2019b). *What can be done?* <https://caninearthritis.co.uk/managing-arthritis/complementary-therapies/>

Cartlidge, H. (2014). *Evidence for the use of post-operative physiotherapy after surgical repair of the cranial cruciate ligament in dogs.* <https://www.theveterinarynurse.com/review/article/evidence-for-the-use-of-post-operative-physiotherapy-after-surgical-repair-of-the-cranial-cruciate-ligament-in-dogs>

Cartlidge, H. (2015). *Hydrotherapy for the osteoarthritic dog: Why might it help and is there any evidence?* <https://www.theveterinarynurse.com/Review/article/hydrotherapy-for-the-osteoarthritic-dog-why-might-it-help-and-is-there-any-evidence>

Cassu, R. N., Silva, D. A., Genari Filho, T., & Stevanin, H. (2012). Electroanalgesia for the perioperative control pain in dogs. *Acta Cirurgica Brasileira*, 27(1), 43–48. <https://doi.org/10.1590/S0102-86502012000100008>

Dycus, D. (2020). *Laser therapy in companion animals.* <https://todaysveterinarypractice.com/recovery-rehab-laser-therapy-in-companion-animals-2/>

Formenton, M., Pereira, M., & Fantoni, D. (2017). *Small animal massage therapy: A brief review and relevant observations.* Available from: https://www.researchgate.net/profile/Maira-Formenton/publication/320949487_Small_Animal_Massage_Therapy_A_Brief_Review_and_Relevant_Observations/links/5ff34bcca6fdccdb82e6c74/Small-Animal-Massage-Therapy-A-Brief-Review-and-Relevant-Observations.pdf

Han, H. J., Kim, J. Y., Jang, H. Y., Lee, B., Choi, S. H., & Jeong, S. W. (2010). Clinical effect of additional electroacupuncture on thoracolumbar intervertebral disc herniation in 80 paraplegic dogs. *The American Journal of Chinese Medicine*, 38(6), 1015–1025. <https://doi.org/10.1142/S0192415X10008433>

Hubbard, R. (2017). *Companion animal OA: How to ease pain and discomfort.* Available from: <https://www.vettimes.co.uk/article/companion-animal-oa-how-to-ease-pain-and-discomfort/>

Hurtley, M. V. (2002). *Muscle, exercise and arthritis.* Available from: <https://ard.bmj.com/content/61/8/673>

Hutchinson, T. (2018). *Overview of osteoarthritis.* Available from: <https://www.vettimes.co.uk/article/overview-of-osteoarthritis/>

Koh, R. (2020). *Use of acupuncture for pain management.* <https://todaysveterinarypractice.com/use-of-acupuncture-for-pain-management/>

Lane, D. M., & Hill, S. A. (2016). Effectiveness of combined acupuncture and manual therapy relative to no treatment for canine musculoskeletal pain. *The Canadian Veterinary Journal*, 57(4), 407.

Le Bars, C. (2008). *Physical techniques utilised in canine complementary therapy.* Available from: <https://www.vettimes.co.uk/article/physical-techniques-utilised-in-canine-complementary-therapy/>

Li, F., He, T., Xu, Q., Lin, L.-T., Li, H., Liu, Y., Shi, G.-X., & Liu, C.-Z. (2015). What is the acupoint? A preliminary review of acupoints. *Pain Medicine*, 16(10), 1905–1915. <https://doi.org/10.1111/pme.12761>

Mancinelli, E. (2016). *Therapeutic laser treatments.* Available from: <https://www.vettimes.co.uk/article/therapeutic-laser-treatments/>

McKenzie, B. (2018). *Uses, evidence, and safety of laser therapy: The future of laser therapy and its conflicting evidence.* <https://www.veterinarypracticenews.com/uses-evidence-and-safety-of-laser-therapy/>

Perry, L. (2019). *OA treatment and management protocols – part 2: Case study.* Available from: <https://www.vettimes.co.uk/article/oa-treatment-and-management-protocols-part-2-case-study/>

Royal Canin. (2019). *Body condition score.* Available from: <https://www.royalcanin.com.au/products/products/dog-products/dog-s-body-condition/dog-body-condition>

Sharifi, D., Bakhtiar, J., Marjanmehr, S. H., Ranjbari, A. R., & Fatahian, H. R. (2003). Histomorphological evaluation of acupuncture therapy on radial fracture healing in dog. *Journal of Veterinary Research*, 58(1), 73–77.

Sharifi, D., Bakhtiar, J., Marjanmehr, S. H., & Zarinmehr, M. (2004). Evaluation of the effect of acupuncture therapy in treatment of muscle injuries in dog. *Journal of Veterinary Research*, 59(2), 161–166.

Skeldon, D. (2018). *Helping old age animals – Joints, movement and nutrition.* Available from: <https://www.vettimes.co.uk/article/helping-old-age-animals-joints-movement-and-nutrition/>

University of Liverpool. (2019). *Load score.* Available from: <https://dspace.uvora.pt/rdpc/bitstream/10174/19611/2/liverpool%20OA%20in%20dogs%20-%20load.pdf>

WSAVA. (2019). *Muscle condition score.* Available from: https://vet.osu.edu/vmc/sites/default/files/images/Muscle%20condition%20score%20chart%202021_3_0.pdf