The Challenging Rehab Patient Mini Series

Session Two: Physiotherapy in more depth

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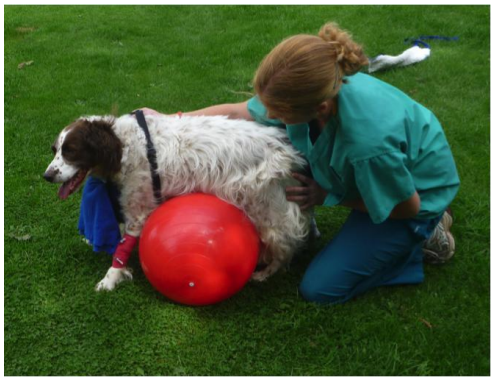

What we will cover: Movement & exercise therapies, including basic principles of exercise prescription, Soft tissue techniques, Manual therapies, Electrotherapies, Hydrotherapy, Owner Advise

Movement & exercise
Within this lecture we will cover the broad spectrum of movement & exercise therapies, including: Passive Range of movement, Active Range of movement, Facilitated movement patterns, Progressive exercise regimes

Range of Movement - ROM
The available movement of a joint is dependent upon a number of factors including; shape & component parts of the joint, as well as supporting structures, confirmation of the patient, function…
Range of movement is not a concept exclusive to the skeletal structures, muscular & soft tissue structures also have available 'range'

When considering ROM exercises need to consider the different movement planes & the type of movement you aim to achieve. Consider: Flexion versus extension, Abduction versus adduction, Internal versus external rotation

ROM treatment techniques are used predominantly when there is a reduced voluntary ROM in a joint/muscular structure/limb. Their importance lie in maintenance & recovery of joint range, soft tissue length, joint nourishment, comfort & function

ROM exercises cover a large number of techniques, choice of technique is usually dictated by functional ability & desired outcome. Treatment options include: Passive range of movement, Active assisted range of movement, Active range of movement, Active resisted range of movement

Passive Range of Movement techniques involve the movement of a joint through available range without any voluntary muscle contraction. Benefits of PROM include: Pain relief & reduction of stiffness, Maintenance of joint nourishment, Maintenance of functional ROM of joints & limbs therefore maintaining overall good movement & function of the patient as a whole

Structures that may limit PROM include: Joint capsules, Periarticular structures (including: muscles, ligaments, & tendons), Skin. For example: in the situation where there has been a superficial wound affecting the extensor structures of a joint, disordered scar tissue formation will limit flexion of that joint

Indications for PROM include: If a patient is unable to actively move a joint through range, If active movement or weight bearing could be detrimental, Preceding application of a stretch, For relaxation purposes, Ordering new tissue formation in the situation of soft tissue damage

Contraindications & cautions include: Poorly controlled pain or muscle spasm, Trauma

The application of PROM involves, relaxing your patient into a lateral recumbency, then Introduce your touch before applying PROM technique,
Support & stabilise the desired limb/joint & move distal structures relative to proximal. Use a slow, gentle motion, monitoring the patient throughout. Always be assessing for: Quality & feel of movement through range, Muscle tone, Available range, Patient comfort throughout range, End feel

***Active* Range of Movement**
This covers a large spectrum of techniques & functional abilities including: Active ***assisted*** through range, Active through range (without resistance or assistance), Active ***resisted***

The benefits of AROM exercises are similar to those mentioned for PROM, but also include: Strengthening, Motor re-education, Proprioceptive re-education

Limitations to active ROM again are similar to PROM however will also include weakness. Indications include motor re-education & progressive strengthening & return to function

Active Assisted ROM treatment involves a combination of facilitation by the therapist & active/voluntary muscle contraction from the patient. We need to think about muscle length & speed of contraction, & external influences most importantly Force vs Length and Force vs Velocity.

Active Assisted ROM one example of Application
Relax your Patient in lateral recumbency, take the limb to end of range, engage active muscle contraction utilising reflexes, facilitate through lengthened position, patient will be stronger mid range, then facilitate through shortened range. This can be progressed by reducing facilitation either end of range, and further progressed by taking the patient into a functional position & repeating but against gravity

Other methods of assisting active movement include: Buoyancy supported movement, Facilitated postural transitions, Facilitated gait

Active Range of Movement
The next step in our progressive rehabilitation regime requires no facilitation, & we are aiming to work through available range
Think about the element of resistance, as this may limit active range of movement…
Indications for AROM include: Strengthening & motor re-education, Functional rehabilitation, Proprioceptive re-education
Progressive exercise regimes can increase through range active range of movement utilising long grass, shallow water, circles, independent postural transitions…

Resisted Active ROM
This is the next step in progressive strengthening through range. As its name suggests, this treatment involves adding resistance to active exercise. Indications include further strengthening. Resistance can be in the form of: Gravity; the weight of a limb, Therapist induced, Hill work, Carrying or pulling loads, Weights…

Facilitated Movements
These are movement therapies with a very functional format. You need to know & understand the muscle groups involved in the movement, & how the desired movement pattern is initiated & followed through. Indications for use of this technique include: Strengthening, Motor re-education, Proprioceptive re-education

These techniques have huge benefits as they are functional, which helps psychologically, & assists in easier manual handling

Motor Re-ed & CPG's
Rehabilitation & movement patterning similar to that seen in facilitated movements & gait is partially aimed at tapping into Central Pattern Generators or CPG's. Evidence of the existence of CPG's goes back as far as a century ago, however there is still relatively little known about these neural control networks. A CPG is a neuronal network capable of generating an organized pattern of rhythmic motor activity. Evidenced initially in studies back in the late 1800's carried out on spinal cord transected dogs as well as those done similar to the work of Philippson who concluded from his studies that the spinal cord controls locomotor activity using both central & reflexive mechanisms

Sherrington's studies in 1910 evidenced that basic motor patterns utilised for walking is the result of reflex actions from proprioceptive sensory organs onto spinal centers. This knowledge is important for the therapist as it evidences the need for sensory stimulation & proprioceptive re-education whenever re-educating & rehabilitating a movement pattern

How do we do this? By utilising techniques involving Movement patterning, facilitated movements & sensory stimulation

What is Proprioception?
Proprioception ties in very closely with CPG's & is an essential requirement for good function. So what is it? It is our sense of position of a limb, it is responsible for the fine tune control of movement that protects the body from risk of injury. The main proprioceptive receptors in the musculoskeletal system include; golgi tendon organs, muscle spindles & pacinian corpuscles. Other proprioceptive sensory receptors are located in joint capsules, ligaments & even the inner ear

Proprioceptive Re-education
We can now see why ROM, postural transitions (both facilitated & independent), different surfaces, & sensory work can be utilised by the therapist to facilitate proprioceptive re-education. We can also see how any injury will potentially effect proprioceptive organs & so this should be a large component of most rehabilitation regimes

Indications for Facilitated Movement:
Functional rehabilitation, by taping into 'normal movement patterns' we re-educate the patient to move in a more efficient & appropriate fashion. This technique will also reinforce the 'hard wired' movement patterns within the CNS – Muscle memory. There are also significant Psychological benefits as there are well documented benefits of exercise on pain & stress relief. Dogs & cats are incredibly functional, also predatory animals by nature, loss of function incredibly detrimental…Manual handling, facilitating movement using key points of control is incredibly beneficial for the patient but also easier for the therapist!

Application of Facilitated Movement
Postural transitions: Observe how an animal will move from one position to another, consider limb movement & position as well as head & neck movement & position, & core movement & position. Think about key muscle groups, so you are happy with where you can bet facilitate. Think about key points of control, think about type of contraction; isometric, eccentric & concentric

Postural Transitions
Lateral to Sternal: the patient leads with head & neck, pushes through dependent TL, engages core to pull up & finish movement. Key muscle groups include; head & neck lateral flexors, TL extensors, core. Points of control include; head & neck, scapula. The movement involves concentric contraction of most key muscles

Stand to Sit: The patient stabilises in core, controlled flexion downwards into tidy sit. Key muscle groups are; PL extensors & core, and points of control icnlude; core, tuber ischii & sternum. The movement involves eccentric contraction of PL extensors, isometric core & TL

Facilitated Gait
When trying this technique use all the same top tips as given for postural transitions. Ways to facilitate gait include: in the water, using hoists & slings, manual facilitation, balance leads

Gait patterning
Ties in very nicely with everything so far discussed, the therapist can utilise static gait patterning to facilitate & rehabilitate dynamic voluntary gait. What you need to know: the normal gait pattern with regards limb placement and how the animal functions as a whole during gait

Gait patterning utilises CPG's, taps into CNS & PNS hard wiring of movement patterns, and assists strengthening, proprioceptive, & functional rehabilitation programs. Static application requires assisting the patient to move all the limbs through the correct gait cycle, don't forget the core! Dynamic application involves balanced gait patterning.

Exercise progression
So how to we progress the patient further? This is based upon basic exercise prescription, which involves the following principles: Specificity: specific to type of exercise (anaerobic/aerobic), movement pattern, & muscle fiber type being engaged. Frequency: how

long or number of sessions in a day. Intensity: how hard the patient is working. Time: length of each session

When progressing exercise think about the latent effect of increased exercise, this tends to be in younger dogs 24hours, and in older dogs 48hours

Exercise prescription should always be progressive & structured, only ever change one thing at a time and continue in a structured manner till back to 'normal'. Think about 'non-formal' exercise as well as 'formal'

Soft tissue techniques
Order of proceedings: we will consider the different types of soft tissue therapies, look at how they affect the tissuesand how to apply the different techniques

We will consider: Massage therapy, Myofascial release therapy, Trigger point deactivation and Stretching

Massage therapy
The application of massage is aimed at achieving physical & psychological change. The technique of massage is based upon manipulation of the collagenous structure of soft tissue. The main constituent of soft tissue is collagen, collagen fibres are arranged in bundles & have a crimp structure
Massage produces most of it effects in the toe region of the stress strain curve
massage

Tissues respond to loading in different ways according to the speed & force used, too quick & hard will actually cause soft tissue to stiffen. Massage is the slow steady application of force to soft tissue structures via the application of hands on techniques. Slow gentle pressure achieves non permanent tissue lengthening via 'creep'

Massage has both physical & psychological effects, the physical effects include: Improve circulation, Reduce oedema, Relieve muscle spasm. The psychological effects include: Reduce stress levels and Improve feeling of well being.

Indications include: Relax the patient, Assist in management of oedema, Management tethered scar tissue, Improve blood flow, Improve sensory awareness, Assist pain management. Contraindications include: Shock, Fever, Acute inflammation, Skin issues, and Infection

Application of technique: Relax your patient into an appropriate position (depending upon what/why you applying the technique). Introduce your touch gently, initially start with global long strokes, gently build into the area you want to treat

Different massage techniques include: Stroking: long & short, Effleurage; think about your anatomy with regards lymphatics, Compressions, Kneading: finger & thumb, Rolling

Always monitor your patient throughout, remember not all dogs are massage familiar. The technique may be better tolerated when used in combination with heat therapy. Feel for any lumps, bumps, heat, tethering… You can teach your owner this technique, observe their application before you send them home

Myofascial release
Differs to massage in the application of a more constant, deeper force resulting in permanent elongation of soft tissue via relaxation, however is based upon similar concepts as the technique aims to manipulate the collagenous tissue structure. I fell this technique bridges the gap from massage to stretching

Indications for use include: Similar to massage, as well as, Fascial restrictions. Contraindications are the same as those for massage

Application of technique: Relax your patient into the most appropriate position. Identify the soft tissue structures you want to effect, then either apply the heal of your hand at a 45^0 angle, or use the shelf your hand can create between the thumb & first finger. Apply constant relatively deep pressure, wait for the tissue to give into your touch, then let your hand glide or give with the tissue. As with all your treatments monitor your patient throughout. This technique works best when used in combination with massage techniques

Trigger point deactivation
When applying massage & MR techniques small focal areas of muscle spasm may be felt these are Trigger points. Definition: *'highly localised & hyperirritable spot in a palpable taut band of skeletal muscle fibres'* or *'a focus of tension within skeletal muscle'* Trigger points can be: Active – tender on palpation, associated with existing pain/motor dysfunction, vary in irritability, or Passive – less tender, found in clinically normal patients, associated with restricted movement, weakness & fatigue, become active by overuse/overstretching. Palpation signs in the canine patient include; location of taut band of muscle, jump sign or other obvious sign of tenderness elicited on manual palpation.

Trigger points cause movement restrictions focally & so contribute to global movement disorder as well as pain. Common sites in the veterinary patient include; Triceps, Adductor & pectineus, Gluteus medius, Quadriceps, Brachiocephalicus. They need treating to relieve allodynia & prevent soft tissue shortening, & global movement dysfunction

Treatment strategies include heat, massage, MR, LASER therapy and Ischemic compression: Isolate the area of tension, apply pressure as tolerated for 20-30seconds then slowly release & reassess, be careful, a lot of small animal patients wont be able to tolerate this technique.

Stretching
Stretching aims to permanently elongate pathologically shortened tissue, in doing so improve the mobility of joints & their surrounding structures. Stretching works within the linear region of the stress strain curve. Weoften need to draw upon this technique following prolonged immobility. It is important to address soft tissue shortening as weak muscles can not cope with shortened soft tissue. Indications for use of this techniqu include; restoring focal soft tissue length to assist in correction of global good movement patterning. Contraindications include; severe pain and/or muscle spasm, and poor skin integrity.

Stretches are usually more effective at elongating the structures which produce the physiological movement, we will consider mobilizations later which are better at addressing tethering of the structure more intimately associated with the joint.

Application of technique, Prior to application of the technique your patient would benefit from some application of heat & massage to assist in improving elasticity of the structures. Think about the specific structure/muscle you are stretching, how many joints does it effect, What movement does it normally produce when contracting? Relax your patient into an appropriate position to allow through range application of technique. Move the distal portion relative to the proximal portion. Hold for 15-30seconds.

Manual therapies
This is a short but sweet section we will consider manual therapies utilised to address movement dysfunction: Mobilisations & glide techniques. There are 2 types of mob techniques: Physiological: utilising the 'normal physiological' movement of a joint, including flexion-extension etc. Accessory: utilising the 'accessory' movement which should occur during physiological movement such as glides & slides

Use of these techniques are indicated when needing to address pain &/or stiffness of a joint, tend to be better at addressing such issues which are caused more by the intimate joint structures such as joint capsules
When applying these techniques be aware of the normal movement patterns, & available movement, both globally of the limbs, & also at the joint surface itself

The grading system involves grade 1,2,3, or 4 mobilisation; Grade I – Small amplitude no resistance (R). Grade II – Large amplitude no R. Grade III – Large amplitude go into R. Grade IV – Small amplitude go into R. Grade 1&2 most often more useful to address pain. Grade 3&4 most often more useful to address stiffness

Contraindications include: Joint instability, infection, malignancy, severe pain, joint replacement surgery…

Application of technique
Physiological mobilisation: Relax the patient in lateral recumbency, Use 3-4 oscillatory movements of the desired area for a couple of seconds, using the appropriate grade & movement pattern, e.g. flexion-extension, Reassess pain &/or movement restriction.
Accessory mobilisation: As previously initially, Think about the movement you are trying to mimic at the joint surface, then stabilise specifically at the joint margin, Apply the appropriate grade according to the desired outcome

Other mobilisation techniques include Scapula glides: this is a lovely technique mimicking the movement of the scapula on the thoracic wall. Technique: Relax your patient into lateral recumbency, Use one hand to stabilise the limb, then gently fix the scapula in the other hand & apply a rotational movement

Electrophysical therapies
In this section we are going to look at the different therapies with regards: physiology behind how they effect the tissues, Indications for use, Mode of application. We will be considering: Thermal modalities: heat & cryotherapy, Electrical stimulation: TENS, NMES, Sound energy: US, Light energy: LASER, Elecromagnetic therapies: PEME

Thermal Modalities
The concept of using thermal modalities to facilitate the healing process & the rehabilitation process is not new. Hot & cold application utilising e.g. cold packs has physiological effects but these are superficial *not* deep

The primary physiological effects of cold include: Vasoconstriction - Reduced blood flow, Reduced cellular metabolism , Reduced permeability, Decreased sensory & motor conduction velocity. These effects have the knock on effect of: Reducing trauma induced oedema, Reduced muscle spasm and Analgesia. Bear in mind the Hunting reflex, which is an oscillating vasoconstriction – vasodilatation, this begins 20-40minutes after application of cryotherapy, it is important to consider it will effect duration of application.

Cryotherapy also has documented analgesic effects & the resultant reduction in reflex muscle spasm due to the Q10 effect, it is also associated with the increased duration of the refractory period. Another potential mechanism for analagesic effects is due to over stimulation of the cold receptors leading to pain control at spinal level. Effects on muscle spasm specifically include: Decreased speed of firing of muscle spindle receptors & golgi tendon organ receptors and raised threshold stimulus for muscle spindle activity.

Indications for use of crotherapy include: Acute inflammation & oedema secondary to trauma and Pain. Cautions & contraindications include: Altered skin sensation, Altered vascularisation, Poorly controlled pain

Application of technique
There are numerous methods of application including; Ice packs, Cold immersion, Cold compression units, Vapocoolant sprays. Your choice of application depends upon your patient, the reason for application, location of application & the desired effect

The primary physiological effects of heat include: Vasodilatation, Increased nerve conduction velocity & decreased latency time, Decreased firing rate of muscle spindle fibers, & increased firing rate of fibers of golgi tendon organs, Increased connective tissue extensibility. These effects can create: Improved connective tissue flexibility and Pain relief

Superficial increased tissue temperature leads to release of chemical mediators resulting in vasodilatation. Stimulation of cutaneous thermoreceptors which synapse on cutaneous blood vessels, cause release of bradykinin leading to vasodilatation. Stimulation of the cutaneous thermal receptors has been proposed to inhibit the transmission of pain via the pain gate theory
Increased blood flow secondary to vasodilatation reduces ischemia resulting in reduced activity of the pain receptors. Decreased muscle spasm further reduces ischemia & pressure on the muscle further facilitating pain relief

Heat therapy is usually indicated in the subacute or chronic stages of healing, or in the situation where there is severe muscle spasm or stiffness. Contraindications & cautions include: Acute inflammation, Active bleeding, Altered sensation, Altered vascularisation

As with cryotherapy there are number of different methods of application, including: Hot packs, Immersion and Self heating via radiation of heat from the body. Choice of method of application depends upon the patient, the site, & equipment available

Electrical Stimulation
Electrical stimulation is used extensively in human medicine & can be used in the veterinary patient as well. Electrical stimulation is used predominantly for 2 reasons: Treating neuromuscular dysfunction: NMES or Pain relief: TENS

Neuromuscular electrical stimulation is the use of electrical stimulation to produce a muscle contraction, it is used in patients where motor recruitment or weight bearing should be avoided or limited or is simply not possible due to weakness. Transcutanseous Electrical Nerve Stimualtion is the use of electrical stimulation to relieve pain

Physiology - NMES
Studies have demonstrated the following beneficial effects of muscle stimulation: Increase in muscle strength & muscle mass, Increase in oxidative capacity of the muscle, Increased perfusion. Recruitment is in the reverse order to volitional muscle contraction; fast twitch fibers first then slow twitch fibers last. The potential detrimental effects have been shown to be: Muscle fatigue secondary to reverse type recruitment of muscle fibers and sometimes Pain .
Application of nmes is indicated when muscle weakness is present & active exercise alone is insufficient to rehab our patient. Contraindications & cautions include: Behaviour of patient, Skin conditions, infection, Pain, Electronic sensing devices, Seizuring patients and Malignancy

Application of technique - NMES
There are a number of parameters that the therapist needs to be aware of when applying NMES, Frequency – rate of oscillations in cycles per second (Hz), Pulse duration – duration of a pule or cycle (ms), Amplitude/Intensity – level of stimulation, ‘On/Off time’ – time the current is delivered vs rest period, Ramp – time elapsed between the current initiating & reaching full capacity

This treatment is tolerated by the veterinary patient however the therapist needs to ensure the set-up is absolutely correct: Make sure your patient is relaxed in a suitable position, the area needs to be clipped to ensure good contact between skin & electrodes & make sure you clean skin to remove grease. Slowly introduce the current. Palpate as well as observe for muscle contraction & always monitor patient response & behaviour throughout the session. Think about muscle groups you intend to recruit, position relative to other muscle groups

Transcutaneous Electrical Nerve Stimulation, there are 2 types; High frequency; 50-150Hz with short pulse duration (40-80μs), stimulates large diameter afferent fibres, creating comfortable paraesthesia without muscle contraction (conventional TENS) and Low frequency; 1-4Hz with long pulse duration (150-250μs), stimulates large diameter afferent & efferent fibres, creates muscle contraction

High frequency: reduces 1^0 & 2^0 hyperalgesia induced by deep tissue injury, increases release of GABA & activates $GABA_A$ in the spinal cord, activates δ-opioid receptors in the spinal cord & RVM, can be used for morphine tolerant patients. Low frequency: reduces 1^0 & 2^0 hyperalgesia induced by deep tissue injury, releases serotonin & activates 5-HT_2 & 5-HT_3 receptors in the spinal cord, activates μ-opioid receptors in the spinal cord & RVM activates $GABA_A$ in the spinal cord

Indications for use if TENS include: Acute pain post operatively or post trauma and Chronic pain. Cautions & contraindications include: Poorly controlled pain, Hypersensitivity, Skin conditions, Open wounds and Seizuring patients.

Application of TENS is the same as nmes, with regards set up & application of electrodes onto the skin. The electrodes can either be placed around the painful site or at the spinal level for the nerve root supplying the painful site. Introduce the intensity slowly & build up to the highest tolerated level, look for that initial behavioural response telling you that your patient can feel something, then go from there slowly.

Sound Energy – Ultra Sound
Therapeutic US is different to diagnostic US. Ultrasound is the application of sound waves/energy to biological tissues to created a biochemical effect, there are 2 main frequencies to have superficial (3MHz) or deep (1MHz) effects. US can effect cells & tissues in 2 ways; Thermal & Non-thermal. Thermal effects include: Increased collagen extensibility, Increased blood flow, Increased pain threshold, Increased enzyme activity, Altered nerve conduction velocity. Non-thermal effects include: Cavitation = formation of μm-sized bubbles/cavities, which vibrate & cause reversible changes in cell membrane permeability, altering activity of the cell, and Acoustic streaming = unidirectional movement of fluid in the US field, when occurring at a boundary of a cell membrane & surrounding fluid, can stimulate cell activity via altering membrane permeability & 2^{nd} messenger activity

Indications for US include: Thermal; pain relief, decreased joint stiffness, increased blood flow, Non-thermal; stimulation of tissue regeneration & repair, Increased blood flow, Protein synthesis. Contraindications & cautions include: Rapidly dividing tissue, DVT, Ischaemic tissue, Exposed nervous tissue, Eyes & Gonads.

Parameters that need to be understood & documented include: Frequency – 1MHz or 3MHz, Intensity – thermal vs non-thermal, 0.25 3.0Wcm^{-2}, Duty cycle – constant vs pulsed, Treatment area – dictates size of treatment head and Treatment duration. You also need to consider: keeping US transducer moving & frequency of application

Light Energy - LASER
Light Amplification by Stimulated Emission of Radiation. Popular perceptions of laser include; cutting, blinding, space-age, heat. Therapeutic laser is an athermic radiation with biostimulation effects, more correctly called low level/low intensity laser. The difference between LASER & 'normal' light sources is that LASER is monochromatic, coherent & collimated

Light photons trigger biological changes within the body, including: Chromophores & cytochromes within mitochondria & at cell membranes absorb photons oxygen production & formation of proton gradients across cell & mitochondrial membranes. Enzymes are activated resulting in the production of ATP. Changes in cell membrane permeability occur. Activation of enzymes that trigger biochemical reactions throughout the body

Effects of LASER specific to wound healing include: Stimulation of fibroblast development & collagen production. Acceleration of angiogenesis & formation of new capillaries. Growth factor response. Vasodilatation & improved lymphatic drainage

Studies have shown LASER to improve; collagen formation, rate of healing, tensile strength, wound closure time, tensile stress & flap survival

Effects of LASER specific to pain management include: Blocking nociceptive transmission selectively, Positively effect release of endorphins, Positively effect trigger points

Human studies have shown significant reductions in pain from chronic joint conditions following LASER treatment. Other potential benefits of LASER include: Studies have shown that application of LASER can increase functional activity, decrease scar tissue formation, decrease degeneration of motor neurons & increase axonal growth & myelination following nerve injury. Studies have demonstrated positive influences on early bone healing following application of LASER…

LASER can treat/prevent: Acute & chronic pain, Inflammation, Nerve damage, Microvascular damage, Wound healing and the Early stages of bone healing… Contraindications & cautions include: Eyes, Rapidly dividing tissue, Genitals, Areas of haemorrhage, Acute infection

Application of LASER with regards time frames depends upon the model used & should be guided by the manufacturer. Parameters that will need considering include: Wavelength; 600-1000nm, Power; 5-600mW and Joules of energy; 1-8J(-40J). You need to protect the eyes of yourself, your patient & the owner, when applying, Make sure the patient is relaxed & will stay still for the desired time frame.

Electromagnetic Energy - PEME
Pulsed Electromagnetic Energy, this works on the principle of pulsating electric & magnetic fields inducing small electric currents in the target tissue, creating changes in the cell environment, restoring the integrity & function of the tissues
Has been used for therapeutic purposes in human medicine for over 40years
Works on the microscopic level, influencing membrane potentials. Normal cellular environment has different 'charges' or potentials inside compared to outside

Damage to the cell causes changes to the normal cell membrane potentials
This altered cell membrane potential makes the cell 'leaky' so fluid is attracted into the interstitial space contributing to oedema, application of pulsating electromagnetic fields can help restoration of normal cell membrane potentials at a faster rate. Studies have also demonstrated that application of PEME can create a hyperpolarisation at synaptic membrane in doing so blocking nociceptive transmission

Neural Regeneration: PEME has been shown to increase current flow into perinueral current flow. Fracture Repair: PEME can cause vasodilatation speeding up callus formation, Stimulation of currents at microscopic level induces voltages which attract osteoblasts to area under treatment

Indications for PEME include: Pain, Oedema, Nerve damage, Fractures & soft tissue Healing.
Cautions include: Rapidly dividing tissue

Manufacturers guidelines are needed with regards parameters. Parameters to consider include: Base frequency: 200Hz & 50Hz & 1400Hz, Pulse frequency: 5Hz, 10Hz, 17.5Hz, 25Hz & Constant & Time of application. Relax your patient into a comfortable position that they can maintain for the desired time frame
Different modes of application include: jackets, leg pads, triple concentric coils…

Hydrotherapy
Hydrotherapy is a type of physiotherapy treatment technique which utilises water to create a therapeutic environment to assist in functional rehabilitation. To be able to utilise hydrotherapy it is essential the therapist understands basic principles & properties of water, as they will both assist & challenge the patient in different ways

Properties of water which need considering include: Relative density: determines if the patient is more likely to 'sink', important in the pool environment, Buoyancy: the 'lift' offered by the water, effected by the depth of water, Hydrostatic pressure: pressure exerted by water on the

body, Viscosity & resistance: creates a more supportive environment, (Thermal effects): same as those when we discussed heat therapy

Benefits of hydrotherapy include: Improved muscular strength, Improved muscle endurance, Improved CV fitness, Increased AROM, Increased proprioceptive input, Decreased stress on healing tissue and Pain reduction

Indications for hydro include: Weakness secondary to surgery or prolonged medical illness or neurological issues, Reduced limb loading as directed by Vet, Chronic joint issues, Maintenance/conditioning for working or sports dogs. Contraindications & cautions include: Heart problems: temp & pressure alters the cardiovascular system, resistance increases heart rate relative to land based exercise, Skin issues: chlorinated water, Ear/eye issues, Water phobic patients

Hydrotherapy can be delivered either via a water treadmill or a pool. Differences include: Closed chain vs open chain exercise, Function movement patterning, Stress level for patient

Adjunctive water based treatments include showering techniques, good at assisting with loosening stiffness, improving blood flow, & increasing sensory awareness

Home Exercise Programs - HEP
Rehabilitation is not just about what is done by the physiotherapist. For successful outcomes therapy needs continuation at home by the owner. Owners need support & guidance as to the best way to continue their own therapeutic interventions at home. The therapist needs to be realistic about what the owner will be able to do. The therapist can hire out equipment where appropriate, but ensure your client has a very good understanding of correct use & application, & are safe using the equipment. All treatments carried out at home by the owner need teaching & practicing with the therapist first.

How to start? Educate owners as to their pets issues/condition, explain to the owners the reason for carrying out certain exercise regimes, also explain the detriment of overload & why not to do too much. Explain principles of exercise prescription. Reinforce that it is about good quality movements, not quantity of exercise. Explain signs of fatigue or deterioration & husbandry advice & explain the Do's & Don't's

Education with regards the condition the patient & their owner is dealing will facilitate management. Owners will appreciate the rehabilitation process much better when they have a good understanding as to why their pet has certain symptoms & why you are advising the regime you choose. Education is also key with regards managing flare-ups/reoccurrences/deterioration

It is important the owner is made aware of signs & symptoms of fatigue or deterioration so they have the skills to monitor the patient continually. Advise & tune your owners eye into compensatory movement patterns, advise of symptoms of pain

Addressing husbandry 'issues' is another key component in the rehabilitation process. Aspects of husbandry that may need considering include: Floor surfaces – inside & out! Steps & stairs, Other pets, Where the patient sleeps, Centrally heated houses & weather conditions, Garden size & complexity, How the patient is transported around, 'Rest'

Owners often need direction not only with regards what not to do but also what they should do. Vets will commonly advise 'cage rest'. You will meet both extremes: Too much too soon & Doing nothing… neither are good! Education will help reinforce all advise & guidance you give your owners

You do need to be cautious with how you communicate with your owner
Always avoid confusion, make sure your owner is happy with exactly what you have discussed & that they have a good understanding of advise & exercises. Use appropriate, clear language & make sure you have a 2 way communication with your owner.