Supportive care of the hospitalised laminitic horse: a nursing perspective

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ABSTRACT: Nursing plays a crucial role in the management of the hospitalised laminitic horse, and can significantly impact both the welfare and the outcome of these critical patients. This review looks at aspects of supportive care for hospitalised laminitic horses that can be provided by veterinary nurses, ranging from monitoring, environmental management, cryotherapy, nutrition, and provision of solar support.

KEYWORDS: Equine; horse; laminitis; veterinary nursing

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Introduction

Laminitis is inflammation of the laminae, which suspend the pedal bone within the hoof capsule of the equine foot. The laminae in the foot which attach the distal phalanx (or pedal bone) to the hoof capsule, can be damaged due to endotoxaemia, excessive weight-bearing or generally any disruption of blood supply to the laminae (Bamford, 2019). This damage can cause the pedal bone to detach from the hoof wall. The pedal bone can then rotate away from the hoof wall, causing extreme pain. This rotation can also be coupled with a 'sinking' of the pedal bone, which can eventually penetrate the sole of the foot (Mitchell et al., 2015).The clinical signs associated with this acute phase of the disease are considered as initial pain, heat and digital pulses. Once the pedal bone rotates or sinks, the condition can be classified as chronic. (Bamford, 2019). All horses can develop laminitis, but some patients are at higher risk than others, when they become ill or injured. These high-risk patients include mares in late gestation (due to extra weight-bearing); horses or ponies with a high body condition score; heavy-weight breeds, horses with pre-existing conditions such as endocrinopathies or metabolic syndromes, for example, Pituitary Pars Intermedia Dysfunction (PPID/"Cushings"); horses fed a high carbohydrate diet, for example, horses in sales preparation or show horses; horses with pre-existing poor foot conformation or a poor farriery history, as well as those with a prior history of laminitis. Certain medical conditions can also predispose horses to development of laminitis, including severe colic (usually surgical colics in the postoperative period); endotoxaemia or sepsis; grain overload (due to ingestion of quickly hydrolysed carbohydrates); any illness resulting in pyrexia; enteritis or diarrhoea; excessive weight-bearing due to contralateral non-weight bearing lameness; and retained foetal membranes and pyometra. Laminitis is a debilitating and potentially life-threatening disease with a reported frequency of up to 34% (Wylie et al., 2011). The disease is complex and multifactorial with several risk factors identified (Wylie et al., 2012). In addition to veterinary treatment, nursing plays a critical role in the management of the acutely laminitic horse, with respect to improving patient comfort as well as minimising potential complications (Floyd & Taylor, 2017). In follow-up to

recent publications discussing the role of veterinary nursing in the prevention of laminitis in the horse (Saul, 2019), this paper aims to outline the nurse's role in providing supportive care of the hospitalised laminitic horse.

Monitoring

Acutely laminitic patients should be monitored closely to detect subtle clinical changes which may indicate progression of the disease, as well as response to treatments (Floyd & Taylor, 2017). Monitoring should be tailored to each patient depending on any underlying conditions. In general, comprehensive physical examinations should be performed several times daily as part of routine monitoring of the patient's systemic condition (Floyd & Taylor, 2017). It is important to establish the baseline digital pulse strength for all feet to facilitate subsequent monitoring of progression. Feet should be examined for increases in heat or digital pulses in all four limbs, and palpation of coronary bands performed for signs of separation (Hurcombe & Holcombe, 2017). Where horses are undergoing cryotherapy, this may mask signs of heat or bounding digital pulses, so temporarily stopping the treatment may provide a more accurate interpretation. In addition to measurement of physical examination parameters, monitoring of daily faecal output and consistency, urine output, feed and water intake, is also important.

Monitoring patient comfort levels is essential to assess response to treatment and clinical progression. Signs of foot pain in the horse may include intermittent or incessant weight-shifting, difficulty or reluctance to move, increased time spent in recumbency, reluctance to lift the limb when asked, saw-horse stance with forelimbs extended, standing with hindlimbs 'camped' underneath the pelvis, stilted gait or slapping hooves down in exaggerated 'hypermetric' manner at a walk (Floyd & Taylor, 2017). The 'Obel Scale' (1948) is widely used to classify pain levels of the laminitic patient (Table 1) (Obel, 1948). More recently, a 'modified Obel' method has been proposed, and shown to be useful for monitoring the laminitic horse in a research setting (Meier et al., 2019). The 'Obel Scale' is a useful and practical tool for reporting and recording pain levels, and categorising patients, in a standard manner (Floyd & Taylor, 2017). Colorado State University has developed a useful tool named the 'Equine Comfort Assessment Scale', which is available free-of-charge on their website (CSU, 2007). This is a comprehensive chart that includes assessment of demeanour, posture and facial expressions (Blossom et al., 2007). Close monitoring for subtle changes in these parameters should be undertaken, which may indicate improvement or deterioration in clinical condition, thus allowing for early intervention and treatment plans to be adapted accordingly. This tool can be used in conjunction with the Obel Scale or Modified Obel Scales. Finally, use of in-stall video monitoring allows patients to be observed without being disturbed.

In the case of long-term inpatients, body weight should be recorded twice weekly. Weigh-tapes can be used to estimate body weights for drug calculations, in the case where patients are unable to walk to weigh-scales. In addition, body condition scoring is a useful tool for monitoring response to nutritional programs (Van Eps, 2017).

Recording of all clinical parameters, Obel scores and amount of time spent in recumbency allows subtle changes in comfort levels to be tracked. Attention should also be paid to patients' general demeanor.

Environment

Close attention should be paid to the environment in which the laminitic horse is housed. Depending on the severity of the laminitis, the horse may be recumbent and oftentimes these patients have difficulty rising and have a tendency to become unbalanced, cast when recumbent, or to lean against walls (Floyd & Taylor, 2017). To minimise trauma and facilitate easy movement, stalls should be at least 15 ft × 20 ft (Floyd & Taylor, 2017). Good ventilation is critical to avoid humidity and maintain a comfortable ambient temperature. In hot climates, addition of air conditioning is essential to avoid over-heating of patients which leads to sweating and development of decubital ulcers. Conversely, in cold climates, addition of ceiling-height heaters may be required. Ideally walls should be padded, or made of wood (Floyd & Taylor, 2017). Presence of a hanger for intravenous fluids and a hydraulic hoist for hanging a sling may be required, depending on the case. Load-bearing wall rings placed around the stall may help if head and/or tail ropes are required to assist rising. Good lighting at ceiling height is required to facilitate monitoring. Where windows are present, they should be protected with a heavy duty metal guard. Consideration should be given to methods of insect repellant, such as blue lights and mosquito screens over windows (Floyd & Taylor, 2017).

Laminitic horses should be provided with a deep layer of bedding (25 cm), unless contraindicated (e.g. in the case of an animal with a full limb cast). In addition, padding on concrete/asphalt floors can help to minimise decubital ulcers. A variety of bedding is available, with wood shavings most commonly used. Some shavings come treated with pine oil to provide fly repellant qualities, however this can be irritant to the skin and eyes in recumbent animals. Damp sand has also been advocated for the laminitic horse. Bedding should be banked high around the walls of the stall to help prevent the animal becoming cast. Stalls should be skipped out frequently to remove faeces and urine-soaked bedding which can exacerbate the development of decubital ulcers (Floyd & Taylor, 2017).

Nutrition

It is important to bear in mind that it has been reported that nearly 90% of laminitis cases presenting at referral hospitals may be due to endocrinopathies (Karikoski et al., 2011). Therefore, this must be taken into careful consideration when designing a nutritional plan. In general, attention should be applied to the provision of easily accessible feed and water sources. Provide food and water at shoulder height for standing horses, and on the ground for recumbent animals (Floyd & Taylor, 2017). Recumbent animals should be offered feed and water at least every two hours (Floyd & Taylor, 2017). Feeds high in nonstructural carbohydrates (NSC) should be avoided (Harris, 2017). The diet of the laminitic horse should be forage-based. Hay should be soaked in water for three hours to remove soluble sugars, and in hot climates this should be reduced to one hour to avoid fermentation (Harris, 2017). Excess water should be fully drained before feeding. In

Table 1. The Obel method of laminitis severity grading (Obel, 1948).

Laminitis Grade	Grade description
Normal	Horse appears sound
Obel grade 1	At rest, the horse shifts weight between the forelimbs; is sound at a walk but has stilted gait at trot in a straight line and on turning.
Obel grade 2	The horse has stilted gait at walk and turns with great difficulty, but one forelimb can be lifted.
Obel grade 3	The horse is reluctant to walk and one forelimb can only be lifted with difficulty.
Obel grade 4	The horse will only move if forced to.

cases with Equine Metabolic Syndrome (EMS) where weight-loss is indicated, feeding should comprise of 1.5% of the horse's body weight in dry weight of good quality hay with <10% NSC (Harris, 2017). Where intake needs to be supplemented, additional calories in the form of good quality omega-3 oil and soaked beet pulp (Harris, 2017). In general, high sugar/starch feeds, molasses, and treats such as carrots/apples should be avoided in the laminitic patient (Harris, 2017). However, it should also be noted that horses in severe pain may not be able to consume sufficient calories to maintain body weight, therefore attention must be paid to providing calorie-dense feeds that are palatable to encourage intake (Floyd & Taylor, 2017). An inappetant horse may be stimulated to eat by moistening feeds, and warming of feeds. Although it is contraindicated to feed high-NSC feeds to potentially endocrinopathic horses, animals in severe pain are likely to by hypermetabolic, therefore more tolerant of high carbohydrate diets (Floyd & Taylor, 2017). Therefore, addition of molasses or small appropriate treats (apples, carrots, freshly cut grass, etc.) may be added to improve intake in inappetent patients. Appetite must also be interpreted with consideration of the medications being administered to the patient. Some oral medications, for example Metronidazole, can result in inappetence. In addition, weight-loss is not the only negative consequence of inappetence. Poor appetite can also exacerbate some of the side effects associated with use of medications commonly used to treat laminitic patients. For example, inappetence can worsen gastric ulceration, which can occur as a result of administration of nonsteroidal anti-inflammatory drugs. Salt licks can reduce boredom and encourage increased water intake. Finally, it has been shown that dietary biotin supplementation (0.12 mg/kg bwt) significantly increase hoof growth rate (Reilly et al., 2010) and so is advised for laminitic horses.

Cryotherapy or digital hypothermia

Continuous therapeutic cooling, known as 'cryotherapy' or 'digital hypothermia', has been shown in experimentally induced laminitis models, to reduce the severity of laminitis (Bamford, 2019; Burke et al., 2018; Reesink et al., 2012; Van Eps & Orsini, 2016; Van Eps & Pollitt, 2010). In addition to providing analgesia, hypothermia has been shown to inhibit invasion of damaging activated leucocytes into the laminae of critical patients (Hurcombe & Holcombe, 2017; Worster et al., 2000). Current recommendations stipulate that hoof temperatures should be maintained below 10 °C in order to be effective (Bamford, 2019). Other studies have shown that, for optimum effect, the hoof wall and laminae temperature should be maintained at 3–8 °C, for a minimum of 48 hours (Van Eps & Pollitt, 2010). In practice, this can be difficult to achieve, and is labour-intensive (Mitchell et al., 2015). Therefore, it is only practical where sufficient staff are available to maintain such therapy. There are several methods employed by hospitals, depending on available facilities, resources and staff (Mitchell et al., 2015). Use of a custom-made ice slurry-filled 'wader' style boot, incorporating both the hoof and distal limb, was shown to be the most effective method to maintain hoof wall temperatures below 10 °C (Van Eps & Orsini, 2016). Submerging the hoof and distal limb in ice slurry buckets was also shown to be highly effective, but is more laborious. Commercially available cooling boots do exist, such as the 'Soft Ride™ Ice Spa Pro' boots and 'Zamar Care Therapeutic Device' for the equine distal limb. Most referral hospitals have installed ice-making machines to aid efficient cryotherapy (Bamford, 2019; Van Eps & Pollitt, 2010). Alternatively, as a lower cost, lower intensity option, placing feet in a 5 L intravenous fluid bags filled with an ice slurry up to the pastern level, is also effective (Reesink et al., 2012) (Figure 1).

Solar support

Integration of specialised therapeutic farriery in the treatment plan plays a crucial role in the successful outcome of the laminitic patient in both the acute and chronic stages, but is particularly important for the long term management of the patient. This can have significant financial implications for the owner, requiring long-term commitment. The aim of therapeutic farriery at all stages of the disease, is to achieve optimum comfort levels for the patient (Floyd & Taylor, 2017). This can be achieved with the application of various therapeutic shoes, which are selected based on radiographic findings and clinical presentation. There is a paucity of case-controlled research verifying the effectiveness of different shoeing techniques, therefore farriery of the laminitic patient should be approached based on biomechanical principles which restore the form and function of the foot (O'Grady, 2017). Techniques are aimed at increasing the ground surface area contact with the foot, repositioning the breakover, elevating the heel and reducing concussive forces (O'Grady, 2017). This can be achieved through a combination of trimming and application of a variety of shoes, such as those with rolled toes, wide-web aluminium shoes, bar shoes, reverse shoes and wooden shoes and clogs, which can either be nailed or glued on (O'Grady, 2017).

In addition to therapeutic farriery, several other non-invasive options are available to provide solar support to the laminitic horse. Foot casts are cost-effective and easy to apply, and can help to reduce lamellar stress by incorporating the sole and frog into the weight-bearing surface, providing cushioning and decreasing expansion of the hoof capsule (Belknap & Bras, 2017). Hoof supports or temporary pads are beneficial to all horses which are suspected of being in the acute stages of laminitis. It is important the support is provided mainly at the caudal two thirds of the foot (i.e. beneath the frog and heels). These can be attached with adhesive bandage, taking care to leave the coronary band uncovered to facilitate monitoring (Mitchell et al., 2015). Dense insulation Styrofoam boards can be cut to the shape of the hoof, providing cheap and effective support across the entire sole. However, they can be difficult to maintain in place, with compression eventually leading to deformity of the pad which may lead to pressure points on sensitive parts of the sole (Mitchell et al., 2015). Commercially available hoof boots (e.g. SoftRide™ Equine Comfort Boot and Easyboot Cloud™ Easy Care Inc.) are easy to use, hardwearing and provide support to the entire sole, however they are expensive and can lead to pressure sores (Mitchell et al., 2015) (Figure 2). Some authors advocate placing sports socks over the hooves before placement in the boots to

Figure 1. A practical method of cryotherapy involves placing feet in a 5 L intravenous fluid bag filled with an ice slurry up to the pastern level, held in place with adhesive tape.

act as liners and protect the skin from ulceration (Floyd & Taylor, 2017). Commercially available heel and frog supports, such as the Lily Pad™ (Nanric) can be held in place with adhesive tape, and provide support to the heel and frog, but may become dislodged and slip (Mitchell et al., 2015) (Figure 3a, b). Finally, solar supports can be made with commercially available impression material which is available as a conforming putty.

Figure 2. Commercially available Easyboot Clouds (Easy Care Inc.) can be used to provide solar support to the entire sole.

These putties can be moulded over the solar surface and act to provide shock absorption qualities as well as customised support to required areas (Mitchell et al., 2015) (Figure 4a, b). It is important to note that mechanical support should not come at a cost to efficient cryotherapy, and where necessary, priority given to cryotherapy (Van Eps & Pollitt, 2010).

General supportive care

Recumbent horses should be turned every four hours to minimise development of decubital ulcers. Grooming twice daily is important to help keep the skin clean and dry at all times. Talcum powder can be applied to skin to absorb any moisture. 'Slinkies', or silky lightweight rugs without metal buckles, may also help to prevent decubital ulcers (Floyd & Taylor, 2017).

Where decubital ulcers have already occurred they should be kept clean and dry. Cleaning of the skin around the wounds with Chlorhexidine scrub solution 0.04%, and lavage with sterile 0.9% saline, should be performed daily. Wounds should be dried thoroughly, and silver-based ointments applied. Pressure points should be checked frequently, particularly under boots or solar pads, to check for skin rubs (Floyd & Taylor, 2017).

Application of insect repellant sprays should be performed frequently to minimise fly activity (Floyd & Taylor, 2017). Attention should also be paid to the body temperature of recumbent horses, and additional methods employed to warm or cool them, as necessary, with the use of rugs, heaters, fans, etc. (Floyd & Taylor, 2017). Stable bandages can also provide additional support and reduce distal limb oedema, thereby promoting vascular circulation in the limb (Floyd & Taylor, 2017).

Consideration and care should be given to the patient's psychological health. Nursing staff should endevour to provide pleasant experiences in between treatments, so that their presence is not always associated with a negative experience. For example, grooming and offering small treats, where appropriate. Stabling the horse opposite to another patient can aid mental stimulus and provide company. Full length open grid entrances, open doors, and low windows, can also allow for recumbent patients to see outside and observe passing activity (Floyd & Taylor, 2017).

Finally, priority must be given to foot hygiene. Depending on the presence of shoes, orthotic packing or solar supports, if possible these should be removed daily to allow feet to be picked out, cleaned, and iodine tincture applied to the sole, if indicated.

Conclusion

Veterinary nursing plays a crucial role in the management of the acutely laminitic

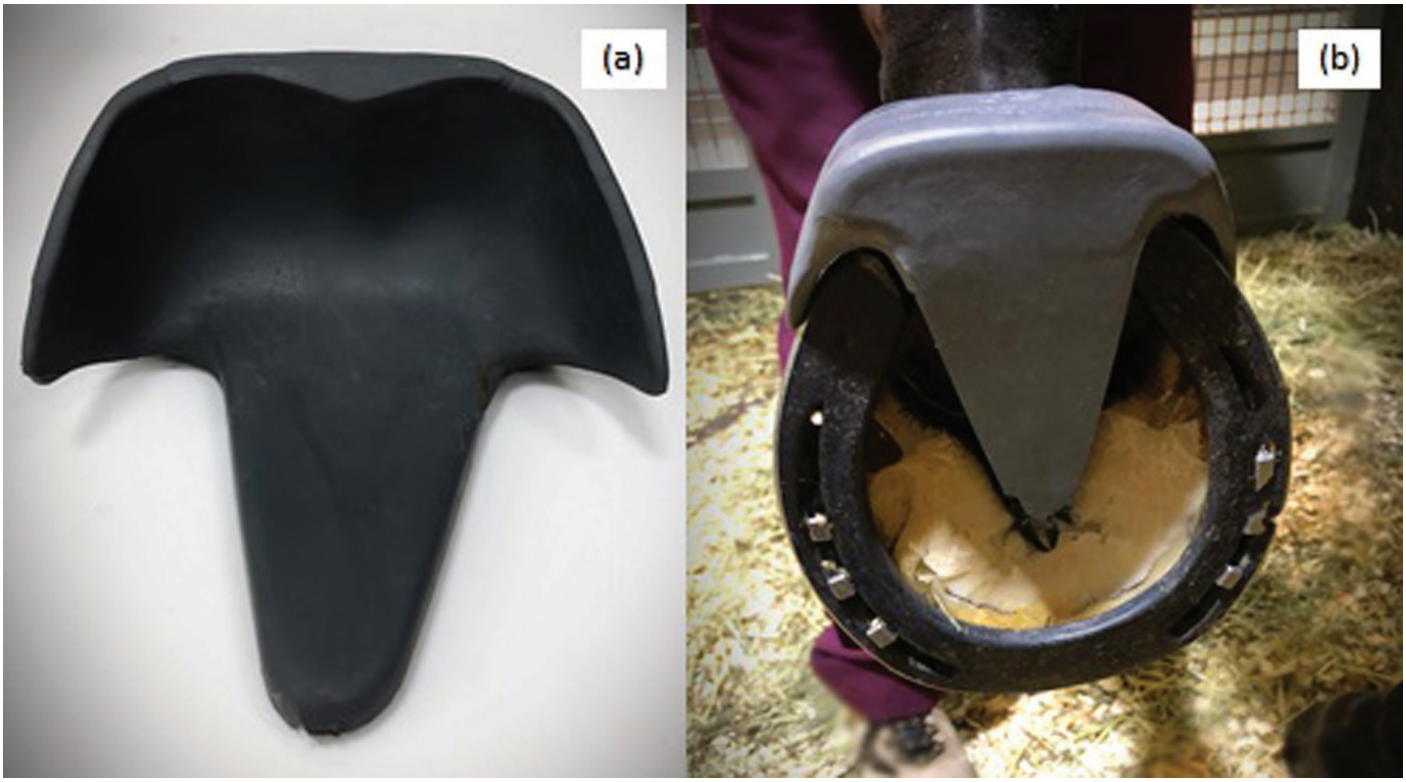

Figure 3. (a, b) Lily Pads (Nanric) are commercially available, and provide support to the heel and frog. They can be used in conjunction with a regular shoe.

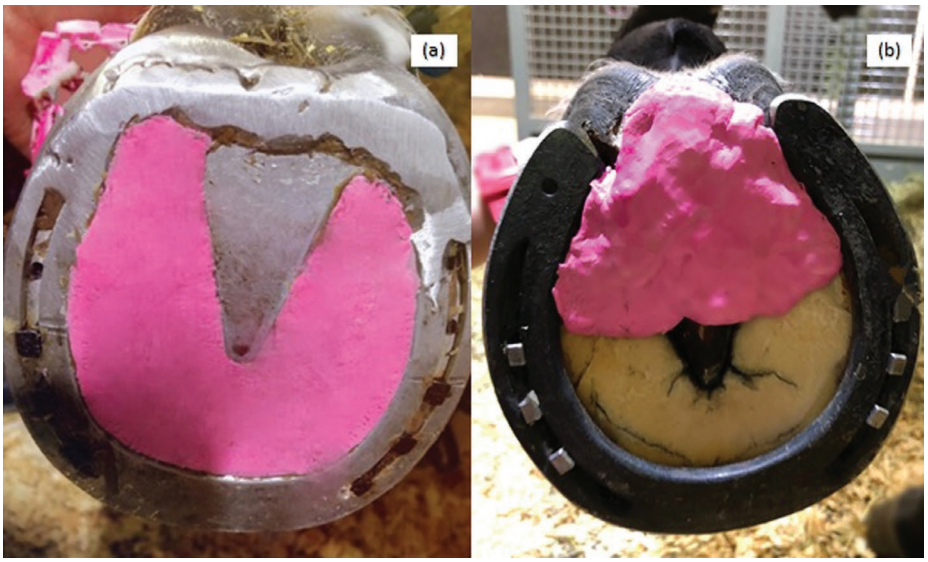

Figure 4. (a, b) Commercially available impression material can be molded to provide support to required areas, over the entire sole (a) or beneath the pedal bone at the caudal two thirds of the foot (b).

hospitalised horse and can significantly impact the outcome of the patient (Floyd & Taylor, 2017). In addition to pharmacological management and remedial farriery, paying careful attention to the patient's environment, nutrition, hydration, and comfort levels, is equally important for patient welfare and survival (Floyd & Taylor, 2017).

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