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Managing gastro-intestinal stasis in hospitalised rabbits: a literature review

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ABSTRACT: There are an estimated 1.5 million pet rabbits in the UK, when compared to cats (11 million) and dogs (9.4 million) this figure may seem small; however, rabbits have been domesticated for a relatively shorter period of time and their population is rapidly increasing in comparison. Rabbits rise in popularity as pets has caused an increase in presentation in veterinary practice. Rabbit owners expect the same high standards of care that dogs and cats receive in veterinary practice, therefore it is essential that veterinary professionals achieve a better understanding about the species to provide efficient care. Rabbits being a prey species often conceal their illness until they are in critical condition, posing a significant challenge to both owners and veterinary professionals in early recognition of clinical signs. Therefore it is essential that registered veterinary nurses (RVN's) and veterinary surgeons (VS) are confident in identifying changes in rabbit behaviour which includes eating habits and faecal output. Recognising symptoms early will aid in implementing treatment and reducing mortality rates.

Keywords: rabbit; gastro-intestinal; stasis; prokinetics

Introduction

Gastrointestinal (GI) stasis is very common and potentially life-threatening condition in rabbits and often requires hospitalisation to manage the condition effectively. According to Harcourt-Brown (2011), all rabbits that are displaying illness should be considered an emergency when presented in practice because when a rabbit is no longer able to conceal its illness it is often in a critical condition. GI stasis is the leading cause of emergency cases in rabbits and prognosis is aided by fast recognition by the owners and the rapid implementation of medical treatment and intensive nursing care (Varga, 2015). Minimising stress and promoting the use of analgesia for these patients is essential to prevent reduced gut motility and compromised patient welfare. Fluid therapy administration varies from cats and dogs because rabbits require smaller cannula sizes and increased fluid rates due to a faster metabolism, (Howie, 2007), highlighting the requirements for rabbit specific protocols in practice. Prokinetics are used to stimulate gut motility and have been found useful in supporting the recovery of patients with GI stasis. Nutritional support for rabbits is species specific because they require a high fibrous diet to promote healthy gut function (Girling, 2013). Therefore, alternative treatments and diets are required when providing nutritional support in veterinary practice. Due to the variety of species that attend veterinary practice, it is vital that RVN's and VS are up to date with continuing advances in the field of rabbit medicine to provide efficient care.

What is GI stasis?

GI stasis is a life-threatening presentation commonly seen in veterinary practice and involves the complex digestive system of a rabbit. GI stasis is defined as a secondary disorder where reduced gut motility or an absence of gut motility occurs, this is usually a result of an underlying condition (Ager, 2017). The health of a rabbit's digestive system is highly dependent on the intake of fibre and requires both indigestible fibre and digestible fibre to work effectively (Harcourt-Brown, 2002). Indigestible fibre stimulates GI motility, therefore a lack of indigestible fibre leads to hypomotility; an

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absence or slowing down of gut movement, which, in turn, leads to GI stasis where the gut motility ceases and faecal production is absent (Decubellis & Graham, 2013). The absence of digestible fibre causes an imbalance of bacteria in the caecum, changing acidity levels and initiating the emitting of gas, causing the rabbit to bloat (Richardson, 2000). As inappetence occurs the body starts to breakdown stored fats for energy causing the production of toxins known as free fatty acids (Harcourt-Brown, 2011). The toxins produced are metabolised by the liver known as hepatic lipidosis which causes damage and leads to liver failure and ultimately death (Harcourt-Brown, 2011). There are various causes associated with GI stasis, because rabbits are a prey species, stress is a major factor, when a rabbit becomes stressed, they produce adrenaline, which reduces gut motility and induces anorexia, leading to GI stasis (Lichtenberger & Lennox, 2010).

GI stasis is usually seen alongside other clinical signs such as: anorexia, abdominal pain, ceased faecal output, lethargy, a gas filled caecum, distended and firm abdomen, an absence of gut sounds and a tense posture (Huynh et al., 2014; Oglesbee, 2011). It is essential to remember that any rabbit which is anorexic or producing a low number of faecal droppings should be perceived as an emergency in veterinary practice (Varga, 2015). In order to provide efficient care for these patients, rapid implementation of nursing management is essential to prevent the condition of the patient progressing (Varga, 2015).

Pain: cause and identification

VS and RVN's have a responsibility to prevent and relieve pain and suffering of patients, managing pain is essential for the symptomatic treatment of GI stasis (Dykes & Orr, 2006, Ritzman, 2014) until the underlying cause is identified and treated. Richardson (2016) explained that managing pain in rabbits can be challenging due to their natural instinct to conceal symptoms, however, slight changes in behaviour often indicate a reaction to painful stimuli. A failure to recognise or relieve pain in rabbits can lead to life threatening consequences due to the stress inflicted (Richardson, 2016). It is the RVNs role to assess for pain in hospitalised rabbits because their care mainly falls upon the RVN to implement. This is supported by Ritzman (2014) who stated that when gas is emitted from the intestine, the gut wall expands and becomes increasingly painful and as the condition progresses, further deterioration of the patient occurs.

Pain scoring systems are very useful and widely used for canine and feline patients, however, their scoring systems are unsuitable to be used in rabbits because not only are they a prey species causing them to conceal illness, but they also display different symptoms of pain (Grant, 2006). The rabbit grimace scale (RGS) shown in Figure 1 is an adapted pain scoring assessment method created especially for rabbits, the RGS indicates changes in facial features as a result of pain and is scored between 0–2 depending on severity (Richardson, 2016). Whereas various studies support the use of the RGS to identify pain, Harcourt-Brown (2011) argued that analgesics should be administered to all rabbit patients if pain is suspected due to their instinctive need to conceal pain. Rabbits should be given analgesics if they are suffering with a condition that is potentially painful because monitoring is unreliable, and the administration of analgesics without confirmation of pain presence is justified due to the potential consequences that may occur if pain is not managed effectively (Dykes & Orr, 2006).

It is important to highlight that behaviour is a main indicator that pain is present and should be monitored frequently during hospitalisation as subtle changes can be significant. It is essential that pain is distinguished from stress, this can be challenging because stress and pain often present with similar behavioural changes as they are often linked and displayed together (Johansen, 2014) (Table 1).

These symptoms are neglected from the RGS which focuses only on facial features including sunken cheeks where they appear flat, abnormal ear and whisker position, and reduced eye widening where they appear partially closed (Varga, 2016). Therefore, all changes should be taken into account when pain scoring rabbits to gain a better understanding of the rabbit's pain level, this is essential to create an appropriate pain management schedule. By assessing facial features as part of the RGS, behavioural changes and physiological parameters, pain and suffering can be relieved, overall improving patient welfare and prognosis (Barter, 2011).

Multi modal analgesia is a combination of medications to achieve the most effective pain management, it works by targeting different receptors in the body to reduce the response to painful stimuli. There are different types of analgesics, most are not licensed in rabbits and can exhibit different side effects, where opioids can cause sedative effects including cardiovascular depression and reduced gut motility, NSAIDS can cause gastric ulceration and should be used in caution with liver or kidney dysfunction (Varga, 2016). Table 2 displays a list of analgesic medications commonly used in rabbits to treat pain, as many of these are unlicensed in rabbits, it is the decision of the prescribing VS to decipher which analgesic to administer, this includes frequency and dose, this can then be relayed to the RVN.

Causes of stress in hospitalised rabbits

A painful response to stimuli is a leading cause of stress in rabbits, therefore the administration of analgesics is important to prevent and reduce stress (Howie, 2007). According to Harcourt-Brown (2002) stress in rabbits has been directly linked to GI stasis. When a rabbit becomes stressed the sympathetic nervous system is triggered, adrenaline released causes inappetance and the motility of the gut to slow, thus leading to GI stasis. Therefore the nursing management of all hospitalised rabbits should include the reduction of stress where possible to prevent GI stasis, further deterioration and promote a quicker recovery. It is important for RVNs to know what triggers stress in rabbits in order to reduce stress for hospitalised patients.

Rabbits as a prey species should be housed far away from predators so they are not able to smell, see or hear a predator. They should also be supplied with a hide to provide a dark, quiet area where they feel safe (Bourne, 2015).

Rabbits can become increasingly stressed when handled therefore handling methods should be assessed beforehand. Tonic immobility is a hypnotic method used to inhibit a rabbit's movement and is a defence action in the wild to appear dead when faced with a predator (Oxley & Ellis, 2015). Buseth and Saunders (2015) suggested that there is a misconception that the rabbit is relaxing in this position but that tonic immobility should be avoided. This is supported by Mcbride's et al. (2006) study which showed that tonic immobility triggered a stress response in rabbits and should not be used due to the consequences that stress causes in these patients. Therefore, handling should be kept to a minimum and when necessary, should take place on a low, non-slip surface and handled in a manner that supports the spine due to it fragility

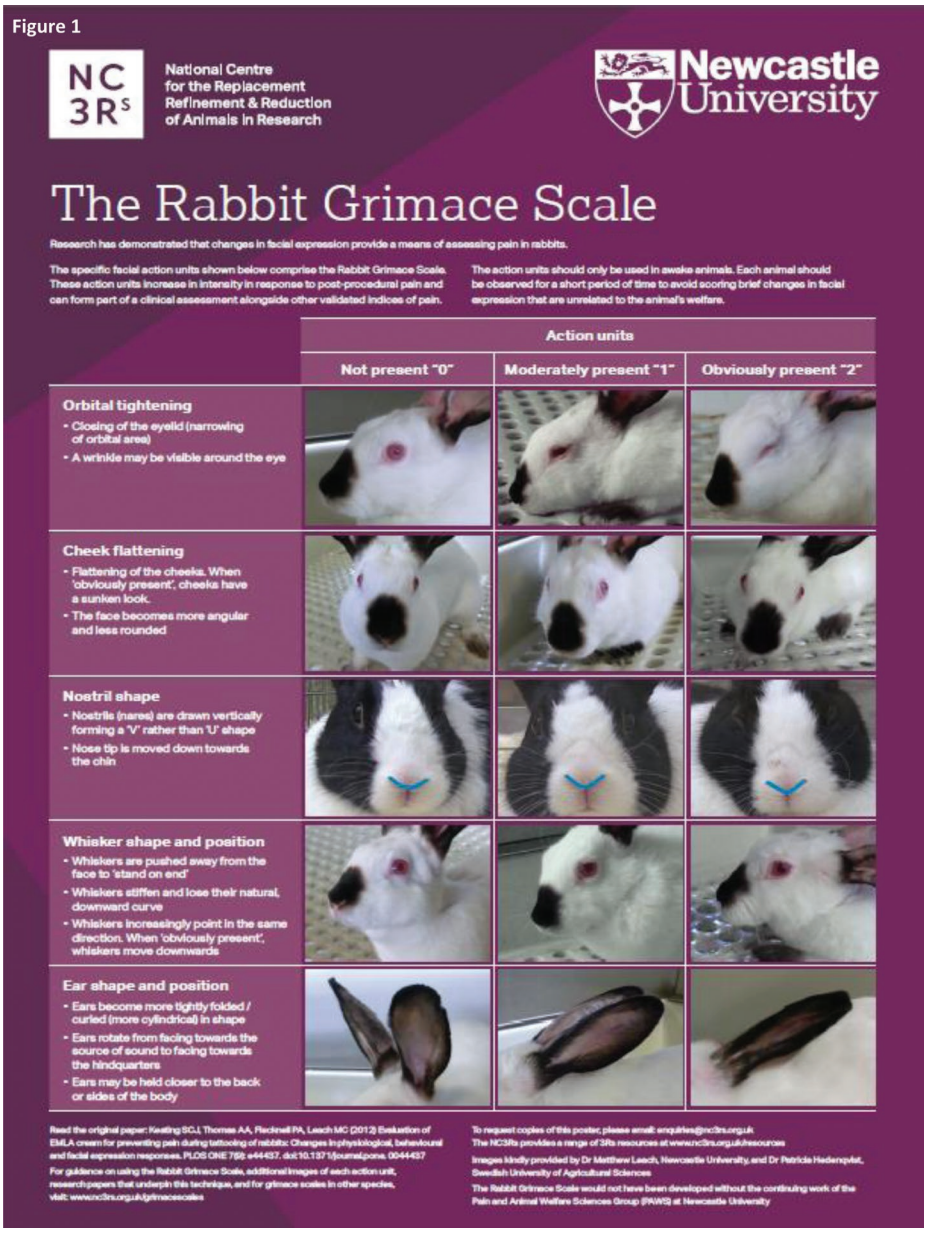

Figure 1. The Rabbit Grimace Scale forms part of the continuing work of the Pain and Animal Welfare Sciences Group (PAWS) at Newcastle University into developing more effective means of assessing pain and welfare in a range of animal species. (Leach & Hedenqvist, 2018).

(Rosewell, 2015). Examinations should also be minimised as much as possible and required treatments should be performed together (Rosewell, 2015).

Section 2 of this article will focus on treatment for GI stasis in hospitalised rabbits, including nutritional support, pro-kinetic therapy and fluid therapy.

Nutritional support

Because rabbits with GI stasis are stressed and anorexic, it is important for RVN's to urgently provide nutrition to prevent hepatic lipidosis. The stress associated with assisted feeding, must be considered in the choice of method (Hamlin, 2011). In a recent GI stasis study involving 145 rabbits by Schuhmann and Cope (2014), the syringe feeding method was successful in 89% (n=130). Naso-oesophageal tubes were not used in this study. Johansen (2014) highlighted that syringe feeding is commonly used, however, safety of administration is questionable because the contents may be inhaled potentially leading to other complications such as acute airway obstruction and aspiration pneumonia. Johansen (2014) stated that syringe feeding needs to be administered every 2–4 hours by repeated administrations which can heighten stress in rabbits, causing further deterioration. Hamlin (2011) stated that when placing a naso-oesophageal tube, care should be taken not to obstruct the nasal passages as rabbits are obligate nasal breathers and obstructing this pathway could lead to dyspnoea and fatality. Similarly, aspiration is also a risk factor when syringe feeding as many rabbits in GI stasis are lethargic and if they are unable to support their head, they may aspirate (Prebble, 2012) According to Rosen (2011) naso-oesophageal tubes allow for the rapid administration of fluids and nutrition, which assists with resuming normal gut motility function quicker than syringe feeding. On the other hand, syringe feeding is a beneficial method because it allows for a high amount of fibrous food to be delivered through a large syringe which is difficult to achieve with the width of naso-oesophageal tube which requires a thinner feeding mix (Harcourt-Brown, 2011). Gajanayake's (2014) study involving anorexic cats stated that naso-oesophageal placement is usually well tolerated but placement does restrict the consistency of food that can be administered due to the narrow tube size. This may be applicable in the nursing management of rabbits, because it has been proven to be a less stressful method compared to syringe feeding in both cats and rabbits (Johansen, 2014). Ideally persuading the rabbit to eat naturally would prevent stress from either method, this can be encouraged in practice by offering and hand feeding a selection of the rabbit's favourite foods (Howie, 2007). More studies are required to determine which method of assisted feeding in rabbits, is most suitable for patients requiring supportive feeding therapy.

Popular choices of syringe feeding diets include Oxbow Critical Care for Herbivores ™ and Supreme Science Recovery Plus™, both of which contain high amounts of fibre, this is essential to replace the rabbit's natural diet and promote healthy gut function (Hedley, 2011). The consistency of the Burgess Excel Dual Care™ diet can be altered by mixing the pellets with water to create a paste, this paste can be administered to inappetant rabbits then offered in pellet form when the appetite has resumed. The diet is beneficial because it is high in fibre and contains pro biotics, both of which assist healthy gut motility. The Oxbow Critical Care for Herbivores ™ diet and Supreme Science Recovery Plus ™ can be reconstituted from a powder with water to create a paste, they are beneficial for assisted feeding but are less suitable for rabbits with resumed appetence due to the consistency. According to Varga (2013) stress can be reduced during syringe feeding by reducing the frequency of administration to 10–15ml/kg four times daily. The choice is ultimately decided by the VS dependant on fibre, protein and probiotic content. It is important to weigh out any food prior to offering to the patient

Table 1. Illustrates clinical signs supported by Prebble (2012) and Howie (2007) and behavioural symptoms assisted by Richardson (2016) and Johansen (2014).

Identifying GI stasis	
Clinical signs	Behavioural indications
Abdominal discomfort	Reduced grooming
Anorexia	Self-mutilation
Lack of faecal output	Withdrawal from companion
Increased respiratory and heart rate	Withdrawal from surroundings
Lethargy	Sudden onset aggression
Tense posture	Reduced movement/exercise
Teeth grinding	
High pitched vocalisation	

Table 2. Displaying commonly used analgesics in rabbits. (BSAVA, 2012) and (Girling, 2013).

Drug	Dose	Route of administration	Uses/Contraindications
Buprenorphine	0.01–0.05mg/kg Every 8–12hrs	Intravenous Subcutaneous Intramuscular	A partial agonist opioid, long acting against moderate pain. Requires repeat administrations increasing stress. Not licensed in rabbits
Butorphanol	0.1–0.5mg/kg Every 4hrs	Intravenous Subcutaneous Intramuscular	A short acting narcotic antagonist opioid. Licensed in rabbits with sedative effects. Caution with renal, hepatic and cardiac impairment. Potential to reduce gut motility in higher doses.
Meloxicam	0.2–0.6mg/kg Every 12–24hrs dependant on dose	Orally Subcutaneous	Can be administered at a lower dose twice daily due to high metabolic rate. NSAID. Unlicensed but used the most frequently in rabbits and processed by the liver. Caution in liver and cardiac impairment. Can cause gastric ulceration in inappetant rabbits.
Tramadol liquid	10mg/kg Every 12–24hrs	Orally	A combination of opioid and non – opioid. Used in mild-moderate pain. Higher doses may have sedative effects. Can be used as an alternative or alongside NSAIDS. Unlicensed in rabbits.
Carprofen	2–4mg/kg Every 24hrs	Subcutaneous	Cox 2 enzyme inhibitor NSAID. Metabolised by the liver but contraindicated in cardiac or renal insufficiency. Not licensed in rabbits.

so this can be reweighed after to monitor input. If inappetant, the amount of liquid nutrition administered should be measured and accurately recorded to monitor input. Output is more difficult to monitor but is usually visible in the patient kennel, bedding can be weighed if the patient has urinated to estimate fluid output and droppings counted. Accurate record keeping is essential to monitor input and output effectively (BSAVA, 2012).

Use of prokinetics

Prokinetics are drugs used to stimulate gut motility via peristalsis stimulation, the most widely used prokinetics in rabbits include: metoclopramide, ranitidine and cisapride, doses for rabbits are displayed in Table 3 (Ritzman, 2014). Schuhmann & Cope, 2014 study revealed they utilised the use of pro-kinetics alongside assisted feeding in order to stimulate gut motility, they implemented these treatments on 145 rabbits where 89% (n = 130) where successfully medically treated, the combined methods used suggest their use to be beneficial. In Harcourt-Brown (2007) study, the sample size was relatively small with 76 participants and out of this amount only 15 were treated medically with either metoclopramide or cisapride as their prokinetic treatment. In this study, 13 of the 15 rabbits that were treated, successfully recovered from GI stasis. However, Huynh and Pignon (2013) argued that metoclopramide is not licensed for the use in rabbits because there is no pharmacokinetic or pharmacodynamic data supporting its use, and therefore it is not a validated treatment technique. Decubellis and Graham (2013) stated that ranitidine should only be used in cases with long-term anorexia and when stomach ulceration is present, they continued and explained that the anti-gut ulcer properties in ranitidine are especially useful in stressed rabbits. Prokinetics should never be used in cases where obstruction is the suspected cause of GI stasis, as administration of this drug may cause a rupture in the intestines (Ager, 2017).

Prior to the use of pro-kinetic medications and assisted feeding, diagnostic imaging of the abdomen should be performed. Ultrasonography assists in assessing multiple structures including: liver, kidneys, bladder, reproductive organs and heart, where this may aid in identifying an underlying painful condition, it is unsuitable for diagnosing ileus because it does not provide a clear picture (Girling, 2013). Magnetic Resonance Imaging (MRI) is excellent at assessing soft tissues and would be a more useful technique than ultrasonography in identifying obstructive and non-obstructive ileus. However, MRI's require an anaesthetic to perform and some anaesthetic drugs may cause a further reduction in GI motility, furthermore, MRI's are not always an option in first opinion practice (Girling, 2013). Radiography, however, is ideal, it can be performed in first opinion practice, it does not require an anaesthetic and the use of contrast can be beneficial in identifying obstructive ileus (BSAVA, 2012). Lichtenberger and Lennox (2010) advised the use of radiography throughout the hospitalisation as it is essential to monitor progress. This is to eliminate GI obstruction as a cause of the reduced or absent motility in the gut. An obstruction in the rabbit's GI tract is usually diagnosed when the stomach is very dilated on radiographs and often palpable on examination. Obstruction is often treated surgically, however, medical management is required peri-operatively to stabilise and recover the patient (Huynh & Pignon, 2013). An abdominal radiograph of a rabbit with presenting signs of GI stasis is displayed in Figure 2. The stomach is enlarged but not dilated with gas, the caecum was very full of ingesta, no obvious obstruction was present. The rabbit was diagnosed with a non-obstructive ileus due to a lack of motility in the caecum which required surgery to rectify, the patient was medically management peri-operatively and made a full recovery.

Fluid therapy

Fluid therapy can be used concurrently with prokinetics to stimulate gut motility. Fluid therapy is considered an important adjunctive therapy to prevent dehydration occurring as a result of GI stasis and thus affecting gut motility (Huynh et al., 2016). Fluid

therapy administration in rabbits is commonly delivered either intravenously using the marginal ear vein or subcutaneously (Ritzman, 2014). When placing the catheters in the ear vein in rabbits, care should be taken to not weigh down the ear. In Schuhmann and Cope (2014) study, the subcutaneous route of administration was utilised because it allowed for easier fluid delivery rather than placing an intravenous catheter. They further advised that intravenous administration is preferable for the stabilisation of critically ill rabbits because it allows the rapid administration of fluids and thus enables rapid absorption. Blood vessels in rabbits are often 30–50% narrower than dogs or cats meaning intravenous catheters may be more difficult to place (Girling, 2013). A catheter width of 25–27 gauge is usually the most appropriate size to gain intravenous access and administer fluid therapy, however care should be taken when administering rapid fluid therapy due to the fragility of smaller vessels (Girling, 2013). Depending upon the rabbit breed and size, alternative width of cannulas may be more appropriate, in some cases, intravenous access may be difficult to obtain if the vessels are smaller and fragile. Furthermore, other routes of intravenous access can be explored including the cephalic and saphenous veins to deliver fluid therapy (Girling, 2013). Whilst the intravenous route is the most preferable, it can be stressful for the rabbit to be handled and have a catheter placed, therefore it would be beneficial if a local anaesthetic cream is applied prior to placement to prevent discomfort alongside minimal handling where possible (Ritzman, 2014). Alternatively, fluids can be administered in bolus via an intravenous catheter as illustrated in Figure 3 and 4 reducing stress and the likelihood of the patient interfering with the catheter and giving set.

Maintenance rates for fluid therapy in rabbits are significantly higher than those of cats and dogs with rabbits requiring 100 ml/kg/day compared to 50 ml/kg/day for cats or dogs (Rosewell, 2015). Therefore, it is essential that all RVN's are aware of this significant difference in order to ensure daily fluid requirements are met (Rosewell, 2015).

Subcutaneous fluids contain minimal risks and large amounts may be administered at singular examinations, but they can be uncomfortable for the patient and have a reduced fluid absorption time compared to orally and intravenously (Girling, 2013). No more than 10mls should be administered at one site because this will cause additional discomfort by stretching the skin, ideally it should be evenly spread out, up to 30–60mls of fluid can be administered subcutaneously dependent upon the rabbit's size (Girling, 2013). In moribund, hypovolaemic and severely dehydrated rabbits' subcutaneous fluids are contra-indicated due to reduced absorption and should be avoided (Aspinall, 2011). Intra-osseous fluid therapy is utilised in moribund rabbits when reduced absorption rates of fluids via the subcutaneous route is apparent, and when intra-venous access has proven difficult to obtain (BSAVA, 2012). The intraosseous route should only be used for a short time to grant intravenous access by allowing enough fluid to circulate and expand vessels (BSAVA, 2012).

Oral administration of fluids is beneficial to rehydrate the gastrointestinal tract, but the administration can be difficult depending on the patient's condition and tolerance. Oral administration is contraindicated in patients with over 5% dehydration status and in moribund rabbits as the risk of aspiration is higher (BSAVA, 2012). In cases of GI stasis and reduced gut motility, the enteral route should be avoided as absorption rate is reduced (BSAVA, 2012). The volume of fluid which can be administered at once orally is much lower than other routes typically only 10 ml/kg (Girling, 2013). Therefore it is clear that intravenous access with an appropriately size catheter and correct fluid rate is ideal for rabbits with varying levels of dehydration especially when the patient is suffering from gastrointestinal stasis.

Firstly, calculate the level of fluid deficit and decipher on a route specific to the patient's individual needs taking tolerance and condition into account. After the route of fluid administration is chosen it is important to monitor the fluid intake to prevent over infusion and electrolyte imbalance. When fluid replacement is established, blood pressure monitoring is important, the blood pressure should begin to rise, demonstrating an increase in intravascular fluid volume (Huynh et al., 2016). Electrolytes are altered by the choice of fluids administered; these should be monitored at regular intervals as imbalanced electrolytes may complicate and delay recovery. Weight checks and packed cell volume (PCV) monitoring are also useful indicators of fluid deficits and can indicate if the deficit is reducing or increasing. Remember it is important to group together procedures at one interval to reduce stress for the inpatient. Ideally 50% of fluid losses should be replaced within the first 12 hours and the other half slowly replaced over the next 42–60 hours following this (Keeble et al., 2016).

Conclusion

In conclusion, it is clear that GI stasis is a complicated condition to manage because rabbits are more susceptible to stressful events in practice. Where possible, stress should be kept to a minimum to increase their likelihood of recovery and improve their welfare. Analgesics should be administered to all rabbit patients under the discretion of the VS because GI stasis is a very painful condition regardless of severity and

Table 3. Created using Meredith (2015) and Ritzman (2014), it details commonly used pro-kinetic drugs.

Drug	Dose	Route of Administration	Pharmacodynamic properties
Metaclopramide	0.5–1mg/kg Every 6–12hrs	Subcutaneous or Orally	Encourages motility acting upon the stomach and pylorus. Increases stomach contractions and widens the pylorus; the entrance to the duodenum from the stomach. Anti-emetic and central nervous system stimulator.
Ranitidine	4–6mg/kg Every 8–12hrs	Subcutaneous or Orally	Modifies motility by promoting gastric emptying and preventing gastro-intestinal ulcers. Primarily focuses on the proximal gastrointestinal tract. This is particularly useful for inappetant rabbits due to their naturally high ph acid.
Cisapride	0.1–1mg/kg Every 8–12hrs	Orally	Stimulates gastrointestinal motility and encourages gastric emptying. Cisapride has a wider use of pro-kinetic activity and is able to stimulate the stomach, small and large intestine. No anti-emetic or central nervous system action.

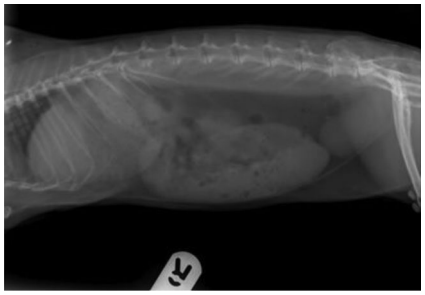

Figure 2. Above displays an abdominal radiograph of a patient with non-obstructive ileus.

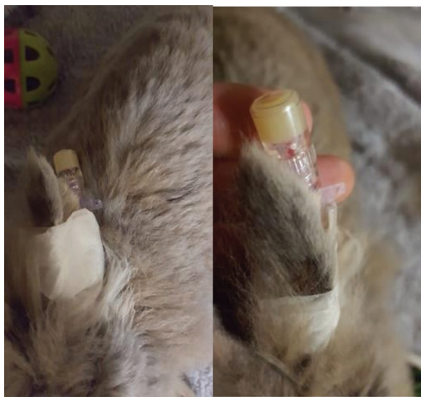

Figure 3 and 4. Duxbury, J (2019) 'A rabbit with an intravenous catheter placed in the marginal ear vein allowing intravenous fluid therapy to be delivered.

withholding analgesia can have detrimental effects to the patient's condition. Species specific pain scoring can be beneficial to aid the assessment of pain in rabbits as well as continue to monitor them individually and effectively. RVN's are essential in the management of pain and reduction of stress because they spend the most time monitoring and nursing these patients. Intravenous fluid therapy is preferred over alternative routes of administration when treating critically ill patients due to rapid infusion rates and subsequent absorption. Supportive prokinetic therapy can be provided in order to promote gut hydration and motility. GI stasis is a life-threatening condition in pet rabbits which requires rapid implementation of treatment, by early recognition and utilising the management techniques discussed in this article, mortality rates of rabbits with GI stasis could be reduced.

Disclosure statement

No potential conflicts.

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