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This issue has two articles on emergency and critical care of the feline patient. To start with, Russell Kenton writes about his recent research project on the ‘shock index’ in cats, and discusses the differences between cats and dogs when it comes to shock. Later in this edition Eleanor Haskey, an experienced ICU nurse, discusses assessing the critical feline patient. This process is important at both admission and when taking over a case. Additionally, in this issue we have more about urinalysis. You may perform urine dipstick tests daily at work — but are you confident interpreting the results? The final article is a really interesting one by Mary Ellen Goldberg. Traumatic injury is unfortunately not uncommon in cats — but could we do more to aid their recovery with physical therapy? Mary Ellen explains what can be done for cats, including hydrotherapy, which is surprisingly well tolerated by some!

As always, thank you for reading Feline Focus and supporting our aim of improving the lives of cats. We have 9600 members now, from all over the world, a real community of cat nurses and technicians!

Best wishes,

Sam Taylor, Veterinary Editor

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NEW FELIWAY® FIENTS for conflicts between household cats
The ‘shock index’: a novel tool for identifying patients with hypovolaemic/haemorrhagic shock

Shock is defined as inadequate oxygen delivery to the tissues. It can be categorised into hypovolaemic, distributive and cardiogenic shock. Clinical signs in cats may differ from other species. In particular, cats may present with bradycardia rather than tachycardia, and in distributive shock causing vasodilation, they may have pale, rather than brick red mucous membranes. A pilot study has evaluated the ‘shock index’ in cats. The shock index is calculated by dividing the heart rate by the systolic blood pressure and values >1.6 were consistent with shock in cats in one pilot study. More research is needed, but the shock index may be useful for identifying shock, providing prognostic information and monitoring the success of therapy.

It is not uncommon to be presented with a cat that is in ‘shock’ in general veterinary practice. It is an emergency and affected patients can deteriorate rapidly without treatment. Road traffic accidents, anaemia, collapse and heart disease are all very common reasons for cats to present in an emergency with signs compatible with shock. However, it can sometimes be difficult to accurately identify which cats are truly presenting in shock versus those with other concurrent disease.

The ‘shock index’ (SI) has been evaluated in human and canine emergency medicine and found to be a useful tool for identification of shock. It is calculated as the heart rate/systolic blood pressure. Studies in dogs have shown that a value of $\geq 0.9$ maximises accuracy, when combined with clinical signs, for identifying shock.

This article discusses shock in cats and how the SI might apply to this species, based on a recent small study by the author.

What is ‘shock’?
Shock is defined as ‘an inadequacy of oxygen delivery to the tissues’, and is often related to reduced perfusion of the tissues. In hypovolaemic or haemorrhagic shock the reduction in circulating...
volume leads to less oxygen reaching the tissues, and reduced removal of waste products, causing cellular damage. Figure 1 reminds us of fluid distribution in the body. There are various classifications of shock including:

- **hypovolaemic shock**: caused by decreased intravascular volume, often due to severe dehydration, vomiting and diarrhoea, loss of fluid into body cavities (pleural/peritoneal effusion) or haemorrhage (also termed 'haemorrhagic shock').
- **cardiogenic shock**: caused by cardiac disease resulting in reduced cardiac output. Cardiac diseases include congestive heart failure, congenital heart disease, cardiomyopathy or arrhythmia.
- **distributive shock**: caused by systemic vasodilation, resulting in a loss of vascular resistance. This is often caused by sepsis or systemic inflammatory response syndrome (SIRS) but can also be caused by anaphylaxis.

**Identifying shock**

Cats can present differently to dogs when in shock, and it can be challenging to diagnose this serious condition. Cats in shock are often hypothermic, have weak or absent peripheral pulses, hypotension and pale mucous membranes (Figure 2). Pallor may be noted even in distributive shock, where dogs often have brick red mucous membranes.

**Signs of shock**

Six clinical signs are associated with shock in cats:

- **heart rate**: low, normal or high;
- **mucous membranes**: pale;
- **capillary refill time**: increased;
- **pulse quality**: reduced;
- **core body temperature**: reduced;
- **mentation**: altered (eg, depression).

---

**Figure 1: Fluid distribution into different compartments in cats**

**Figure 2: In cats, pale mucous membranes can be a sign of shock**
State of the art

It is expected and well understood in dogs to see a reflex tachycardia due to increased oxygen demand; however, it has been observed that cats can have a bradycardia (<120 bpm) with hypovolaemia which can often be confusing.

What is the ‘shock index’?
In view of the importance in identifying and treating shock, the ‘shock index’ (SI) has been studied. It is calculated by dividing heart rate by blood pressure. SI has been evaluated in human settings as a more objective means of identifying shock, and has a negative correlation with oxygen delivery. In humans, an increased SI is associated with increased mortality.\(^4\),\(^5\) Additionally, the shock index has been used as a predictive measure for greater transfusion requirements.\(^6\)

In dogs, SI has been evaluated twice, and the SI has been found to be 0.9 (the same as the human value), meaning that SI values of 0.9 or higher suggest the dog is in shock.\(^2\),\(^3\) SI has never been investigated in cats.

Shock index (SI)
\[ SI = \frac{\text{Heart rate}}{\text{Systolic blood pressure}} \]
An SI value of >1.6 with clinical signs of shock aids the diagnosis of shock in cats.

Key point
As a nurse or technician triaging a patient, obtaining vital signs consistent with shock and informing the attending veterinary surgeon immediately, can accelerate life saving treatment.

SI pilot study
To investigate the feline SI, cats that presented as emergencies to a large referral hospital (Bristol University Veterinary School) in 2015 were recruited.\(^1\) These cats had their heart rate and systolic blood pressure monitored (Figure 3) before any treatment was given.

Main study findings:
- Cats that had clinical signs of shock and responded to treatment for shock (ie, they were more likely to be truly in shock) had a higher SI than cats that did not have signs of shock.
- Cats in shock had both tachycardia and bradycardia (therefore heart rate alone cannot be used as an indicator of shock).
- An SI value of >1.6 with clinical signs of shock aided the diagnosis of shock in cats.
- A systolic blood pressure of less than 90 mmHg was also suggestive of shock, when combined with an SI consistent with shock.

Figure 3: Blood pressure assessment of cats presenting in critical condition is important. Accuracy of readings is improved by minimising stress and taking 3–5 readings.
**Discussion**

**Why is the feline SI value higher than in dogs and humans?**

Cats can present in shock with bradycardia, meaning the ratio between heart rate and systolic blood pressure is greater, increasing the value. If tachycardic, cats also get a greater reflex tachycardia than dogs or humans meaning their heart rate is higher, increasing the ratio.

**How useful is the SI in a first opinion setting?**

Cats with an SI of >1.6 were 86% less likely to survive to discharge, meaning it has the potential to be used as a survival outcome marker.\(^1\)

The SI can also be used to assess response to treatment.\(^7\) If the SI is reducing then it suggests the treatment is effective. For example, if a cat has a heart rate of 120 beats per minute (bpm) and a Doppler systolic blood pressure of 65 mmHg, the SI will be 1.8. If this patient then receives a 5 ml/kg intravenous bolus of isotonic crystalloids and the systolic blood pressure increases to 90 mmHg after 10 mins, the SI is now 1.3. If another 5 ml/kg bolus is given and the systolic blood pressure increases to 120 mmHg, the SI is now 1.0. This correlates with a positive response to treatment.

**Conclusions**

Shock can be difficult to identify in cats, but is an emergency requiring immediate treatment. The shock index was assessed in a pilot study and, combined with clinical and diagnostic findings, shows promise for diagnosing cats in shock and monitoring treatment, although more study is required. An SI of ≥1.6 is the optimum cut off for maximising accuracy (combined with other clinical signs).

**Acknowledgement**

The author would like to thank Sophie Adamantos for her help with the original SI pilot study.

**References**

Urinalysis in cats 3: use and interpretation of urine dipstick tests

Urinalysis in cats 3: use and interpretation of urine dipstick tests

Urine dipstick tests are performed frequently in clinical veterinary practice to assess many chemical properties of cat urine. pH, protein, glucose, ketones, haemoglobin/occult blood and bilirubin can be reliably assessed. Strips must be in date and read at the correct time interval as indicated on the container. Various factors can result in positive and negative results and further assessment, including sediment examination may be required to assist interpretation.

Many chemical properties of cat urine (including pH, protein, glucose, ketones, haemoglobin/occult blood and bilirubin) can be easily and rapidly assessed in-house with the use of dry reagent test strips (dipsticks) (Figure 1). Dipstick analysis provides a semi-quantitative measurement of these various chemical parameters, some of which need to be interpreted in light of the refractometer urine specific gravity (USG) reading. Note that not all chemical parameters present on commercially available dipsticks yield valid results when tested on cat urine.1–6 Urobilinogen, USG, nitrite and leukocyte esterase activity (‘leukocytes’) test pads should be considered unreliable in cats.

Key point

Most chemical tests on urine are performed by dipstick analysis. More complicated chemical assessments, such as urine protein:creatinine ratio, fractional excretion of electrolytes and urine cortisol:creatinine ratio have to be performed by veterinary laboratories.1,2,6,8,9

This is the third article in a five-part series on urinalysis. See Urinalysis in cats 1: urine collection, storage and initial assessment. Feline Focus 2017; 3(2): 41–50 and Urinalysis in cats 2: measurement of USG and what the results mean. Feline Focus 2017; 3(4): 95–99. Parts 4 and 5 will look at the microscopic analysis of urine.
How to...

Dipstick analysis should be performed before centrifugation on either a fresh urine sample or a refrigerated urine sample that has been warmed to room temperature. Urine contact can be achieved by immersion or pipetting. If performing the former, immersion of the dipstick in urine should be complete but brief, to prevent reagents leaching out of pads; excess urine should be removed by tapping the strip against the container to prevent run-off of reagents. The strip should then be held horizontally when comparing it against the chart. The authors, however, advocate the use of a pipette to carefully place a drop of urine on each pad of the dipstick, which is laid horizontally. This avoids any run-off of reagents (the pipette can also be used to load the refractometer during USG estimation). For further ‘dos and don’ts’ on the use of dipsticks see Table 1.

pH
Normal urine pH in cats is 5.0–7.5. Urine pH reflects renal regulation of $H^+$ and $HCO_3^-$ and is affected by many renal and extrarenal factors.

Acidic urine may result from the ingestion of a meat diet, acidifying agents/diets, metabolic or respiratory acidosis, paradoxical aciduria in metabolic alkalosis and protein catabolic states. Alkaline urine may result from urinary tract infections (UTIs) associated with urease-producing bacteria such as *Staphylococcus aureus*, *Proteus* species and *Klebsiella* species, diets low in protein or rich in vegetables, ‘post-prandial alkaline tide’ (occurs while acid is being secreted into gastric juice), alkalinising agents, metabolic alkalosis, respiratory alkalosis (eg, hyperventilation due to stress of travel or veterinary visit), distal renal tubular acidosis and urinary retention (eg, urinary tract obstruction). Table 2 outlines some causes of falsely increased or decreased pH readings in cat urine.

A pH meter may be required to accurately determine the pH (especially in highly coloured urine). In one study, dipstick results were consistently lower than those obtained using a pH meter in cats.
Protein

Urine dipsticks are usually the first-line screening test for detecting the presence of proteinuria. Their colorimetric test methodology primarily measures albumin. The sensitivity and specificity of dipsticks for measuring albuminuria in cats are 90% and 11%, respectively; false-positive results are seen more frequently in cats than in dogs. The sensitivity of dipsticks for measuring albuminuria in cats is 90% and 11%, respectively; false-positive results are seen more frequently in cats than in dogs. The sensitivity of dipsticks for measuring albuminuria in cats is 90% and 11%, respectively; false-positive results are seen more frequently in cats than in dogs.

On the Combur-10 Test dipstick (Cobas) (Figure 1), the protein reaction is graded as negative, 1+, 2+ or 3+, corresponding to <0.06, 0.3, 1.0 and 5 g/l, respectively. The product insert states that the strip’s practical detection limit is 0.06 g/l of albumin. Other commercially available urinalysis dipstick test strips may be graded differently. The product’s package insert information should be checked for the latest updates.

The urinalysis dipstick test may be affected by turbidity and the use of centrifuged supernatant is preferred for turbid samples. Factors that may erroneously affect the protein reading on the urine dipstick are outlined in Table 3.
Increased dipstick protein in highly alkaline urine can be confirmed by another semiquantitative assay, the sulfosalicylic acid (SSA) precipitation test. This test is less sensitive to albumin but will detect other proteins such as globulins and Bence Jones proteins. False decreases by this method occur with highly buffered alkaline urine or dilute urine. False increases occur with massive doses of cephalosporins, sulfa drugs or penicillin, as well as use of radiographic contrast agents or thymol (a urine preservative). A study evaluating cats with chronic kidney disease found that a positive urine dipstick result (≥trace) with a positive SSA test (≥0.05 g/l), a positive SSA test alone, or ≥2+ urine dipstick result alone, were indicative of proteinuria and warranted protein quantification with a urine protein to creatinine ratio (UPCR) assessment.

A persistent proteinuria is defined as positive test results on three or more occasions, at least 2 weeks apart. If persistent proteinuria is identified in the absence of an active sediment, a UPCR test should be performed. Measurement of UPCR is also recommended for assessing any chronic kidney disease in cats, as outlined in the International Renal Interest Society (IRIS) guidelines.

### Table 2: Artefacts associated with dipstick analysis of urine pH

<table>
<thead>
<tr>
<th>Factors that can increase urine pH</th>
<th>Factors that can decrease urine pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Alkalising fluids and drugs including acetazolamide, sodium bicarbonate, chlorothiazide and potassium citrate</td>
<td>• Acidifying drugs: ammonium chloride, ascorbic acid at high doses, citric acid and methionine</td>
</tr>
<tr>
<td>• Containers standing open for prolonged periods prior to testing, resulting in loss of carbon dioxide</td>
<td>• Contamination of the pH pad by buffer leaching from the adjacent protein test pad</td>
</tr>
<tr>
<td>• Urease-positive bacteria producing ammonia during delays in processing with urine at room temperature</td>
<td>• Ingestion of meat</td>
</tr>
<tr>
<td>• Low protein diets</td>
<td>• High protein diets</td>
</tr>
<tr>
<td>• A very recent meal: ‘post-prandial alkaline tide’ likely due to increased acid secretion into stomach</td>
<td></td>
</tr>
</tbody>
</table>
The UPCR measurement eliminates the necessity of a 24 h urine protein measurement but the test is best performed after a period of confinement without access to a litter tray to maximise the volume of urine on which it is based. In dogs, to avoid the effects of stress it is strongly advised that three separate samples are collected at home and then pooled, with a single measurement made by the laboratory.13 This collection protocol may also be applicable to cats, especially given that cats often exhibit much greater stress responses than dogs.

Standard practice chemistry analysers cannot be used to measure urine protein and creatinine. Standard practice chemistry analysers are calibrated for plasma, in which the concentration of protein is 500–1000 times higher than in urine, and so cross contamination is a significant issue. Creatinine concentrations are 25–100 times higher in urine than in plasma, which makes it necessary to dilute urine samples before measurement.14 There is one specific in-house test, the UPCR test by IDEXX analysers (Catalyst and VetTest). This test has not been independently validated and the authors have expressed concern about potential problems in a prior publication.16

Multistix PRO (Bayer) dipsticks that measure urine protein and creatinine concentrations and UPCR have been evaluated. In cats, the dipstick results for UPCR did not correlate with the quantitative values.17

**Albumin**

Normal cats have a urine albumin concentration of <0.01 g/l at a USG of 1.010.1 Semiquantitative, species-specific, ELISA-based microalbuminuria dipsticks are available to detect 0.01-0.3 g/l of urinary albumin in feline urine (ERD Health Screen Feline Urine Test; Heska). As urine concentration influences the concentration of albumin, the tests are performed on urine samples that have been diluted to a USG of 1.010.

In humans, most cases of renal failure occur secondarily to diabetes mellitus or essential hypertension, and evidence suggests that early increases in albuminuria (microalbuminuria) reflect glomerular damage that is undetectable by UPCR determination.14,38 However, routine screening of cats is not justifiable, especially for those that are clinically healthy. Healthy cats may show an age-related increase in urinary albumin concentrations. In one study, 73% of cats over 16 years had microalbuminuria.19

Although it is likely that patients with microalbuminuria have renal lesions, not all cases require investigation (as the lesions may be mild and non-progressive) and, in some cats, microalbuminuria may be transient.1 In addition, many systemic disease states, including hyperthyroidism, have been associated with microalbuminuria in non-azotaemic cats.14

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**Table 3: Artefacts associated with dipstick analysis of urine protein**

<table>
<thead>
<tr>
<th>False negatives — causes</th>
<th>False positives — causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bence Jones proteinuria</td>
<td>• Highly alkaline dilute urine (pH &gt;9) or moderately alkaline concentrated urine</td>
</tr>
<tr>
<td>• Dilute urine</td>
<td>• Quaternary ammonium disinfectants or chlorhexidine</td>
</tr>
<tr>
<td>• Acidic urine</td>
<td></td>
</tr>
</tbody>
</table>

Information based on studies 1, 2 and 11
Thus, even if it is a marker for incipient renal disease, many of the other diseases linked with microalbuminuria can lead to illness or death before renal disease is of any clinical consequence. Some studies have also demonstrated that the semiquantitative microalbuminuria test should not be relied on as the sole determinant of proteinuria; while microalbuminuria and proteinuria are commonly seen in cats with a variety of diseases, they are not necessarily both increased and the UPCR can be increased despite negative microalbuminuria.

**Glucose**

Normal urine should be negative for glucose. Based on a scientific conference abstract that detailed a study on six healthy cats, it is usually accepted that glucose is completely reabsorbed by the feline proximal renal convoluted tubules if the serum glucose is less than 15–16 mmol/l (270–288 mg/dl). However, some cats do seem to display glucosuria when serum glucose is less than 15 mmol/l. Thus, conventional wisdom may be incorrect due to small study population size and healthy cats, or it may be that cats are difficult to assess accurately due to transient stress hyperglycaemia prior to urine collection.

One study compared urine glucose measurement by the Glucotest Feline Urine Glucose Detection System (Purina; for use in litter) and the Multistix (Bayer) dipstick. The Glucotest was found to more accurately estimate urine glucose than the Multistix dipstick; however, the test has since been withdrawn from the market. The Bayer Multistix was inaccurate in approximately 25% of cases (79% were overestimations, which is a concern for diabetic monitoring and also for diagnosis as there was an overestimation in samples that were negative for urine glucose). Assessment of glucose in this study was by visual test pad inspection, and not by the Clinitek 100 Analyzer (Bayer) used in laboratories; thus the accuracy of the automated analysis is unknown.

Glucosuria in cats occurs with hyperglycaemia (due to stress, diabetes mellitus, corticosteroids, progestagens, thiazide diuretics, glucose-containing fluids) or renal pathology including proximal renal

---

**Table 4: Artefacts associated with dipstick analysis of urine glucose**

<table>
<thead>
<tr>
<th>False negatives and underestimations</th>
<th>False positives and overestimations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Refrigerated urine: samples should be returned to room temperature before testing</td>
<td>• Bayer Multistix test pads (other available dipsticks not validated for cats)</td>
</tr>
<tr>
<td>• Ketones: if urine is positive for ketones and negative for glucose, check blood glucose on a fluoro-oxalate blood sample and measure serum beta-hydroxybutyrate</td>
<td>• Cephalexin and enrofloxacin can both cause false-positive results with urine glucose tablets and strips in dogs. Cats may similarly be affected</td>
</tr>
<tr>
<td>• Out-of-date pads</td>
<td>• Enrofloxacin has caused underestimation of glucose in dogs in vitro tests (ie, enrofloxacin added directly to urine samples containing dextrose). Cats may similarly be affected</td>
</tr>
</tbody>
</table>

Information based on studies 1 and 2
tubulopathy (especially due to nephrotoxic insult; eg, aminoglycoside, amphotericin B, lilies), occasionally chronic kidney disease, and transiently after urethral obstruction.\(^1,7,20,23\)

Factors that may erroneously affect the glucose reading on the urine dipstick are outlined in Table 4.

**Ketones**

Normal cat urine should be negative for ketones as ketones are completely reabsorbed by the renal proximal tubules.\(^1\)

Dipstick pads (eg, Keto-Diastix; Bayer, Figure 3) and tablets use nitroprusside reactions that only detect acetoacetate and acetone, not beta-hydroxybutyrate (\(\beta\text{OHB}\)), the ketone largely responsible for metabolic acidosis and the main ketone in diabetes mellitus. Urine assays tend to underestimate the degree of ketonaemia in initial diabetic assessment. Conversely, there is overestimation after treatment with insulin as serum \(\beta\text{OHB}\) metabolises to acetoacetate, and ketonuria should be expected for at least 3–4 days despite successful treatment of diabetic ketoacidosis.\(^1,6,21\)

Causes of ketonuria include diabetic ketosis/ketoacidosis, starvation or prolonged anorexia, lactation, hyperthyroidism and paracetamol toxicity.\(^1\) Factors that may erroneously affect the ketone reading on urine dipsticks are outlined in Table 5.

**Table 5: Artefacts associated with dipstick analysis of urine ketones**

<table>
<thead>
<tr>
<th>False negatives — causes</th>
<th>False positives— causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Delayed sampling: acetone is volatile and evaporates, acetoacetic acid is degraded by bacteria</td>
<td>• Highly pigmented urine (haematuria, haemoglobinuria)</td>
</tr>
<tr>
<td>• Out-of-date dipsticks (ketone pads are sensitive to the effects of moisture, heat and light)</td>
<td>• Highly concentrated, acidic urine (trace reactions)</td>
</tr>
<tr>
<td>• Presence of (\beta\text{OHB}) ((\beta\text{OHB}) is not detected by reagent strips)</td>
<td>• Compounds with sulfhydryl groups (eg, cystine)</td>
</tr>
</tbody>
</table>

Information based on studies 1, 2 and 5. \(\beta\text{OHB}\) = beta-hydroxybutyrate

**Blood**

The dipstick pad for ‘blood’ reacts with haem-containing products.\(^6\) It is more sensitive to haemoglobin (diffuse colour change) than intact erythrocytes (spotting). The pad can be positive due to haematuria, haemoglobinuria or myoglobinuria, so a positive test needs to be assessed with concurrent sediment
How to...

**Bilirubin**

Bilirubin in urine is conjugated (only conjugated bilirubin is water soluble and able to be freely filtered by the glomerulus). Unconjugated bilirubin (bound to albumin) can only escape through the glomerulus if there is significant glomerular disease and thus would also be associated with significant proteinuria. Cats have a high renal threshold for bilirubin and feline kidneys do not conjugate bilirubin, thus feline bilirubinuria is always abnormal and suggests the presence of a hepatobiliary or haemolytic disorder.

In humans, up to 5 red blood cells (RBCs)/μl (referred to as physiological microhaematuria) is normal. Equivalent quantitative determinations have apparently not been carried out for cats, but a few RBCs are often present in the urine of normal cats. With commercially available dipsticks, such as the Combur-10 Test, the practical detectable limit for intact RBCs is 5 RBCs/μl of urine; and for haemoglobin or haemolyzed RBCs is 10 RBCs/μl of urine (refer to product insert). In comparison, visual detection of blood in urine is only possible when RBCs number approximately 2500/μl of urine.

Interpretation of urine dipstick pads for blood and haemoglobin may be problematic in the presence of severe haematuria as the pads may be unable to reliably differentiate haematuria and haemoglobinuria. Sediment examination of the urine sample may be useful in this instance although RBCs may lyse in vitro, especially in dilute urine, and up to 50% of RBCs may be lost following centrifugation, potentially resulting in an erroneous diagnosis of haemoglobinuria rather than haematuria. For other factors that may erroneously affect the blood pad on the urine dipstick see Table 6.

**Table 6: Artefacts associated with dipstick analysis of urine ‘blood’**

<table>
<thead>
<tr>
<th>False negatives — causes</th>
<th>False positives — causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Failure to resuspend blood cells that have settled to the bottom of the tube</td>
<td>• Iodine and bromide (unlikely as requires large quantities of contaminants)</td>
</tr>
<tr>
<td>• Nitrites produced in urinary tract infections (unlikely)</td>
<td>• Hypochlorite and other oxidising agents in disinfectants (also unlikely)</td>
</tr>
<tr>
<td>• Ascorbic acid (in large quantities)</td>
<td></td>
</tr>
<tr>
<td>• Formalin as a preservative</td>
<td></td>
</tr>
<tr>
<td>• Out-of-date reagents</td>
<td></td>
</tr>
</tbody>
</table>

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Critical care 1: assessment of the critical feline patient

Critically ill cats frequently present to the veterinary clinic. The first step in the management of these cases is patient assessment. This allows us to identify urgent problems with three major body systems: the cardiovascular, respiratory and neurological. Nurses should feel confident to be able to perform a patient assessment, interpret results, and alert the veterinary surgeon if any abnormalities or changes are detected.

Any critically ill patient presents a challenge to the veterinary team, often requiring invasive diagnostic tests, advanced procedures, constant monitoring and tailored nursing care. They can be demanding and frustrating cases which require input from many members of the team, but at the same time immensely rewarding. For those who regularly nurse sick cats, you will know that they don’t play by the rules. Cats behave differently to dogs in the hospital environment, they are generally much smaller (creating challenges in their management) and their response to disease processes is often different to their canine counterparts.

It is important that nurses involved in nursing any critical cases are familiar with how to deliver effective care to these patients, and have an interest in handling cats. Other nurses who are less confident can then work alongside the lead nurse to improve their feline critical care knowledge and handling skills.

Patient assessment
First, as part of our nursing process, we need to assess our patient and decide what our goals in nursing care are. Sometimes it can be

Key point
Examine critical patients in quiet areas, away from dogs. Restrain gently utilising towels and blankets, and consider sedation if necessary. Coinside examination with routine analgesia in hospitalised patients.
Clinical nursing

helpful to include this information in a list or a care plan so that we do not get lost along the way. This assessment may be made during our initial triage of the patient or it may be made at the beginning of your shift if you are taking over a case. The aim of our patient assessment is to gain as much information and as many pieces of the puzzle as possible, while minimising patient stress. A full clinical examination should be carried out with focus on the cardiovascular, respiratory and neurological systems. Abdominal palpation can be useful in detecting abnormalities such as masses. An accurate weight and an assessment of body condition should also be performed.

Cardiovascular system assessment

There are several parameters that we can observe to give us information about the cardiovascular system. Heart rate must be interpreted in context with other findings from our clinical examination, eg, blood pressure and hydration status. Cats can often hide occult heart disease so cardiac auscultation is particularly important and may identify murmurs, arrhythmias or gallop sounds. Pulses should be palpated at the same time to determine pulse deficits. Peripheral pulses can be tricky in feline patients so most people use a femoral artery as it is easier to find and palpate. Cats in shock tend to present with bradycardia (heart rate

Feline friendly handling examination

Nurses should be able to recognise signs of fear and anxiety and should be familiar with how to reduce both (Figure 1). Carney et al and Rodan et al have published a set of nursing care and feline friendly handling guides, respectively, which are open access on the Journal of Feline Medicine and surgery website (see reference list). These guidelines contain recommendations to reduce feline stress levels during hospitalisation. Cats should always be examined in a quiet place such as a consult room away from dogs. Ideally, they should be gently restrained on a table so that a full nose to tail examination can take place, but in some situations you may need to examine the patient where they feel comfortable (eg, carrier or cage). The examination should start by allowing the cat to initiate contact first — by holding a hand out and allowing them to rub against it/sniff. In recumbent patients a padded bed should be placed onto the table to avoid discomfort during the examination.

Towels/blankets can be used to help restrain nervous patients so that they can hide. If a cat becomes fearful during an examination or treatment, then take a break and allow it to settle. Question what it is you are doing and is it absolutely necessary? Heavy restraint should always be a last resort. If procedures are essential, then consider a sedation plan such as butorphanol 0.1–0.2 mg/kg IV/IM/SC or timing procedures with analgesia dosing.

Figure 1: A feline patient displaying signs of stress in the hospital. Note the ear position (ears laterally rotated) and hypersalivation indicating nausea
100–120 beats per minute) in contrast to dogs, which will be tachycardic. Often cats will be tachycardic due to travelling to the clinic and being in an unusual environment. Any pulse irregularities can be double checked against an ECG. If this is something that we wish to use as an ongoing monitoring tool, then we can consider attaching the ECG pads to the patient’s thorax, as cats dislike having the pads taped to their feet.

Mucous membranes and capillary refill time can give us information about perfusion. Cats generally have paler mucus membranes than dogs, and it can be more difficult to appreciate jaundice. If you are unsure, then you can also look at the conjunctiva to help with your assessment.

Monitoring blood pressure (BP) is important in critical patients. Gold standard invasive BP measurement involves the placement of an arterial catheter, often in the dorsopedal artery connected to a transducer to create a waveform trace (Figure 2). This can be very technically challenging in the feline patient and usually is only ever attempted in the anaesthetised patient undergoing a complex surgical procedure. Care should be taken managing arterial lines in cats and they should be removed at the earliest opportunity as they can be linked with thrombosis and limb ischaemia. Manual BP measurements can be taken from the metacarpal, dorsopedal or tail artery with a Doppler sphygmomanometer. Systolic BP should be less than 150 mmHg, mean BP 100 mmHg and diastolic 80 mmHg in a healthy cat. Trends should be monitored and hypotension should be addressed with the use of fluids or vasopressors. If hypertension is documented (systolic BP>160 mmHg) then the BP should be repeated at several intervals to rule out a spurious reading or so called ‘white coat hypertension’, associated with stress. Ocular examination is recommended for hypertensive cats, to look for signs of retinal detachment and impaired vision.

Respiratory system assessment
Respiratory rate, effort and pattern should be assessed before we handle the patient. We can gather an enormous amount of information about where the problem may be by watching and listening to how the patient breaths. Upper respiratory problems can be linked to an increased inspiratory phase, often with stridor and stertor, and lower airway disease can be linked with an increased expiratory phase of breathing. Auscultation should be performed in four quadrants of the thorax on both sides. Crackles may

**Tip**
If using an ECG to constantly monitor a cat, put the ECG pads on the thorax and not the feet, as they will find this more comfortable.

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**Figure 2:** Invasive blood pressure waveform in an anaesthetised cat
Clinical nursing

indicate bronchopulmonary disease such as pulmonary oedema, whereas wheezes are associated with asthma. Dull lung sounds ventrally may indicate a pleural effusion whereas dull lung sounds dorsally may be as a result of a pneumothorax. In patients where volume overload and pulmonary oedema is a concern then jugular pulsations may be seen.

Oxygen should be administered to any patient in respiratory distress. Short-term options include mask or flow by with the latter being better tolerated (Figure 3). Minimal stress and restraint is vital in cases of respiratory distress as these patients can decompensate at any time and develop respiratory arrest. Light sedation such as butorphanol (as mentioned previously) can be beneficial in order to calm distressed patients and aid in examination or procedures. Longer term oxygen therapy can be delivered via an oxygen cage (Figure 4). Ideally, any emergency that presents in respiratory distress should be placed in an oxygen kennel (eg, buster box) if available and given some time to de-stress after travelling to the practice. If an oxygen kennel is not available, then you can cling film a kennel door and pipe oxygen in via an anaesthetic machine. Care should be taken to monitor patient temperature in an oxygen kennel as they can become very warm and humid very quickly.

Pulse oximetry can be used to provide information about oxygen saturation; however, it can be difficult to get an accurate reading in a conscious cat. The probe can be clipped onto an ear. If, however, this causes stress to the patient then attempts should be aborted. While arterial blood gas sampling is the gold standard for assessing oxygenation and ventilation, it is technically very challenging in the feline patient due to their size and

Key point

You can learn a lot about a patient’s respiratory system by simply observing them at rest in the hospital cage. Look at the rate and effort of breathing, and listen for any abnormal sounds such as stridor and stertor.
may only be possible in the anaesthetised/semi-conscious individual. Samples for blood gas analysis are taken from the dorsopedal or femoral artery.

**Temperature measurement**

Rectal temperature should be checked as hypothermia is common in the sick feline. Hypothermic patients should be warmed slowly to a normal temperature. Although hypotensive warming can help improve blood pressure, aggressive external warming can lead to a change in peripheral perfusion and vasodilation which can lower BP. The use of hot air warming devices may be preferred to heated pads, which carry a risk of thermal injury, particularly in the recumbent or semi-conscious patient that cannot move away from the heat source.

**Neurological system assessment**

Each time we interact with the patient we should assess mentation. If the cat’s neurological status is altered, then we need to consider reasons why and explore other factors that can affect mentation such as electrolyte imbalances. There are four main categories for describing mentation:

- **Normal**: reacts normally to surrounding environment, is responsive and alert.
- **Obtunded**: lethargic and withdrawn from the surrounding environment unless stimulated.
- **Stuporous**: patient responds only to a noxious stimulus and the response may not be appropriate.
- **Comatose**: the patient does not respond to a noxious stimulus.

In cases where mentation is a concern due to the possibility of raised intracranial pressure (ICP) we can use the Modified Glasgow Coma Scale to subjectively assess our patient. This scale scores the patient on level of consciousness, posture and cranial nerves. The higher the score the better the prognosis and chance of a positive outcome. BP and heart rate (hypertension and bradycardia) can also be assessed to look for a Cushing’s reflex linked with raised ICP.

For patients with a brain injury it can be beneficial to administer oxygen therapy and to place them on a 35° angle with their head elevated. Care should be taken to avoid occluding the jugular veins which may lead to increasing intracranial pressure. Blood samples in these patients should be taken from a peripheral vein.

**Hospitalisation**

Ideally, critical patients should be hospitalised in a clinic that can offer 24 h nursing care as they are at risk of acute deterioration. If 24 h nursing care is not an option then it may be necessary to develop a rota so that overnight care can be delivered in such instances.

**Key point**

The Cushing’s reflex describes the phenomenon of hypertension and bradycardia noted in patients with increased intracranial pressure.

The hospital environment can be a terrifying place for feline patients. Stress, on top of the disease process will slow recovery and worsen the prognosis. Ideally, cats should be housed in a quiet area with minimal traffic, well away from dogs. This is not always possible and so we need to implement steps to minimise stress in mixed ward areas. Cat forts (see http://www.cats.org.uk/uploads/documents/feline_fort_info_for_vets_updated_vr3.1.pdf),

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cardboard boxes or a towel over the door can provide cats with an area to hide in (Figure 5). Comfortable bedding (perhaps something from home) and the correct cat litter can put nervous cats at ease. The lights can be dimmed for periods of quiet time and overnight. Feline synthetic pheromone diffusers should be plugged in and topped up. Cat friendly kennels can be installed which are polypropylene and have separate toilet and sleeping areas. Incubators can double up as an oxygen kennel and warming source and they can often be sourced second hand. Again, they should be partially covered to allow the cat an area to hide, yet the cat still be monitored. Noisy dogs in the ward should be discharged as soon as possible, or moved elsewhere in the clinic. Alternatively, cats could be housed in a collapsible cage elsewhere in the clinic, as long as they are still regularly assessed.

Conclusions
All nurses working with critical feline patients should feel confident in carrying out a patient assessment. The cardiovascular, respiratory and neurological systems should be assessed as a priority, highlighting any life-threatening problems. Nurses should be familiar with picking up signs of stress in feline patients and know how to alter their approach to minimise further anxiety during both handling and hospitalisation of the patient. More experienced members of the nursing team who are confident in nursing feline patients should work alongside junior nurses in order to teach and mentor. A thorough patient assessment allows the team to develop a plan for the patient and nursing considerations can then be prioritised for the individual.

References

Key point
Stress slows recovery for cats. Consider if you can improve your ward area to make it less stressful for cats, and make sure they always have somewhere to hide.
Feline physical rehabilitation: what can we do?

Cats undoubtedly benefit from physical rehabilitation. Successful treatment relies not only on the correct choice of the physical therapy used but on a cat friendly approach. Sessions should be kept short and easy to follow. Prior to beginning any rehabilitation, the cat must be examined by the rehabilitation veterinarian, checked to make sure pain is not an issue and a therapeutic plan prepared. The most common reasons to perform physiotherapy in cats are generally related to injuries sustained as a result of trauma or joint conditions and obesity.

Developing a programme for a cat that needs physical rehabilitation is sometimes challenging, but can be done. The misconception exists that cats will not cooperate when asking them to perform therapeutic exercises. However, if you ask them nicely, they will usually be receptive! Successful physical rehabilitation with cats demands a good understanding of feline behaviour, including excellent handling skills.

What is physical rehabilitation?
Physical rehabilitation or physiotherapy is concerned with physical function, and considers the value of movement and the optimisation of physical potential as being core to the health and wellbeing of individuals.1 Manual therapy (eg, massage, passive range of motion, stretching), thermotherapy (eg, hot and cold), electrotherapy (eg, laser therapy, ultrasound therapy, neuromuscular electrical nerve stimulation [NMENS]), exercise therapy (eg, basic exercises for the postoperative orthopaedic and neurological patient, hydrotherapy, seawater therapy, rehabilitation support) and manual therapy (eg, massage, passive range of motion, stretching) are some of the commonly used therapies in feline rehabilitation.

Key point
The rehabilitation nurse must be skilled at recognising pain in feline patients. The therapy will have little to no benefit if the patient is painful. Immediately alert the rehabilitation veterinarian if you suspect pain in your patient and stop physical therapy.

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strengthening exercises, flexibility exercises, endurance exercises, balance and proprioception exercises, gait re-education, postural management for neurological patients, positioning and chest care for intensive care patients and maintenance exercises for recumbent patients) can all be used in feline patients.

The most common reasons to perform physiotherapy in cats are generally related to injuries sustained as a result of trauma or joint conditions. The certified physical rehabilitation veterinarian and or physical therapist will prescribe which modalities the certified rehabilitation veterinary technician or nurse should carry out. Some therapies are only performed by the rehabilitation veterinarian.

Cats often make willing patients but sessions should be kept short and interesting, and should be undertaken in a quiet, relaxed environment. Cats are most often referred for rehabilitation for osteoarthritis, fractures, neurological conditions, femoral head and neck excision (FHNE) and weight reduction. Cats appear to have fewer developmental orthopaedic diseases and orthopaedic injuries as a whole.

Manual therapy
The therapies that veterinary technicians/nurses can perform include massage, range of motion (ROM) exercises and stretching.

Massage
Massage is defined as the therapeutic manipulation of the soft tissues of the body, and has mechanical, physiological, and psychological effects. When massaged, muscle is mechanically stretched, reducing its tone and increasing its pliability. Over time, this can lead to a reduction in muscle soreness and an increase in

Range of motion (ROM) exercises
- **passive ROM exercises**: these manually exercise joints through their natural pain-free range without voluntary muscle contraction. They are typically performed in patients with stiffness secondary to surgery or in weak patients unable to walk on their own.
- **active ROM exercises**: these put joints through active muscle contraction. Activities include using cavaletti rails (ie, a system of rails placed at adjustable heights and widths); climbing stairs; swimming; and walking in water, sand or tall grass.

Stretching
Stretches are also passive movements that help to improve or restore full range to a joint or full length to a muscle. Stretches create plastic (permanent) deformation and an increased length/range. Long-term effects of stretching include adding sarcomeres to muscle mass. Stretching is generally more effective if preceded by light exercise, massage, heat or therapeutic ultrasound, all of which increase the extensibility of collagen.

Tip
Prior to the first visit, ask the owners what ‘treats’ their cat enjoys. Having a variety of low-calorie, palatable treats on hand is helpful in bonding with the cat and goes a long way to establishing trust for future rewards after therapeutic exercises.
connective tissue strength. Scar tissue is also mobilised and softened, helping to maintain movement between tissues and restore function after injury or surgery.

Physiologically, massage increases interstitial pressure, which in turn increases venous and lymphatic flow. Massaging in a distal to proximal direction is recommended to move fluid from the extremities back to the central circulatory system. As the hands move, squeeze, and stretch the tissues, pressure differences are created between one tissue and another. High pressure pushes fluid and irritating metabolites into the vasculature and areas of low pressure draw in new fluid. This flushing effect may be responsible for decreasing inflammation, pain, and muscle fatigue. The body and mind are both linked to the skin via the nervous system. Different types of touch will elicit different types of mental responses.

Psychologically, massage decreases stress and anxiety, produces relaxation, and improves emotional wellbeing (Figure 1). The types of techniques used are stroking, effleurage, compression (kneading, wringing), friction and percussion.

Electrotherapy

Many electrotherapy modalities can be used on feline patients. All possess inherent dangers and should only be used by operators who have received specialist training.

Laser

The mechanisms by which low-level laser therapy (LLLT) decreases pain includes release of endogenous opioids, changes in conduction latencies of nerves, increase of cellular metabolism, increase in circulation, promotion of neovascularisation, decrease in fibrosis formation and reduction of inflammation. Feline conditions that respond well to LLLT include osteoarthritis, degenerative lumbosacral stenosis, fractures, chronic wounds and stomatitis. Most cats tolerate the treatment well as it is not in itself painful and requires a relatively short time to deliver the treatment (Figure 2).
Ultrasound
For deep tissue heating in veterinary physical therapy, therapeutic ultrasound (ThUS) is the commonly used modality to improve the extensibility of connective tissues, to decrease pain and muscle spasms, and to promote tissue healing and improve the quality of scar tissue.  

The biological effects of ultrasound differ depending on the used mode: using a continuous mode, the thermal effects are maximised and it is, therefore, primarily used for tissue heating before stretching. If pulsed ThUS mode is used, the thermal effects are decreased but other effects occur based on the phase of tissue repair, including the acceleration of the inflammatory process, increased fibroblast proliferation, and increasing tensile strength of healing tissues.

Neuromuscular electrical nerve stimulation (NMENS)
Electrical stimulation (ES) can be used for muscle strengthening and pain control. Neuromuscular electrical stimulation is a form of ES whereby current is used to stimulate a motor nerve and cause the contraction of a muscle or muscle group. To stimulate a denervated muscle (eg, in patients with spinal cord injuries), the muscle fibres must be excited directly and the ES is then called electrical muscle stimulation. For pain control, analgesia occurs because of several mechanisms such as the gate control theory and the release of endogenous endorphins. The most commonly used type of ES for pain control is transcutaneous electrical nerve stimulation (TENS).

Therapeutic exercises
Therapeutic exercises are one of the most important parts of the rehabilitation process. The design of the therapy programme depends strongly on the needs of the individual patient and should ensure that the exercises can be performed safely without the risk of worsening the clinical signs. The exercises should be selected based on the stage of tissue repair, and therefore, the rehabilitation veterinarian should understand the underlying pathology, the expected recovery progress, and biomechanical considerations.

Exercise represents the final element in the process of helping a cat achieve optimum function following injury, surgery or disease. If assistance is required for the animal to perform an exercise, this can be provided manually or with the aid of ‘physio-rolls’, slings, harnesses or carts.

Therapeutic exercise may be used to improve:
- aerobic capacity and endurance;
- agility, coordination and balance (static and dynamic);
- gait and locomotion;
- neuromuscular capability and movement patterning;
- postural stabilisation;
- range of motion;
- strength and power; and
- reduce pain.

Land-based exercises
Land-based exercises (such as bicycling, assisted standing, weight shifting, playing with laser lights)
Types of therapeutic exercise

- **strengthening**: strength is the ability of a muscle or muscle group to produce tension and a resulting force. Exercises to improve strength create an increase in the myofibril component of the muscle, thereby increasing the cross-sectional area of the muscle. Strengthening exercises include such activities as running, slope work (uphill and downhill), use of leg or body weights, dancing, wheelbarrowing and swimming.

- **flexibility ( suppleness)**: describes the capacity of the muscles, tendons and ligaments to stretch, allowing the joints to have a larger ROM, and the cat to be able to manoeuvre through awkward spaces. Flexibility is important for cats as it also helps to protect against injury. Flexibility exercises include activities that make the cat reach or stretch for something, or encourage crawling under, through or over obstacles.

- **balance and proprioception**: balance is the ability to adjust equilibrium at a stance (static balance) or during locomotion (dynamic balance) to take account of changes in direction or ground surfaces. Proprioception is the unconscious perception of movement and spatial orientation originating from the body. It is the body’s way of knowing where all its different parts are and what they are doing. Proprioception diminishes with age, and is also affected by injury or surgery, especially following neurological damage. All cats need good balance and proprioception to function normally. Balance exercises include activities requiring rapid responses to changes in supporting surface (eg, wobble cushion, balance pad, trampoline) and changes of direction when moving, as well as playing with toys, dancing and standing on a gym ball. Proprioception exercises (Figure 3) include weight shifting, walking in circles or weaving, walking over obstacles of various shapes, height and spacing, and walking over different terrains.

- **endurance (stamina)**: this allows animals to perform activities for prolonged periods of time without tiring. Exercises to improve aerobic endurance usually target muscle groups for periods exceeding 15 minutes, and are repeated several times each week. Long-term changes occur in muscle, including increased vascularisation, alongside decreased resting heart rate and increased stroke volume (allowing greater time for ventricular filling), decreased resting blood pressure and increased respiratory enzymes. Endurance exercises are less relevant to cats, which rely more on stealth and rapid movements to catch prey.
and wheelbarrowing) should form the major component of exercise programmes designed for cats.

**Water-based exercise**

Hydrotherapy is one of the most useful forms of rehabilitation therapy, and has become a very popular modality for dogs to help in the recovery of musculoskeletal and neurological

**Box 1: Underwater treadmill treatment: tips on introduction and use**

- Initially, when beginning to move the treadmill belt, support and encourage the patient until it takes only 1 or 2 steps forward voluntarily; then stop the belt immediately. This process may only take 5 or 10 seconds, but it should be repeated 2 or 3 times until challenging the cat with a longer duration of up to 1 minute. Many cats will only tolerate only 1 or 2 minute intervals for several assisted sessions regardless of fitness or mobility levels.

- Begin with a very slow speed (often the slowest speed possible), usually no more than 0.23 m/s (0.5 mph).

- Vary the water level initially to find the level where the cat will walk forward voluntarily; then increase slowly to the desired level. Many cats will resist and float their hind limbs or try climbing out of the treadmill with higher water levels. As the patient improves, lowering the water level will increase resistance, which can be advantageous for increasing ROM or aerobic activity.

- Swimming is very difficult on any animal. Unfit patients tire quickly. A life jacket is required for initial introduction to the swimming pool. It also provides a handle to guide and control the patient. It is favourable to allow the patient to swim to a point and return to a resting spot compared with swimming in place.

- Begin with very short, 2–5 minute sessions, when training. Many cats will not tolerate sessions longer than this. Each patient must be judged as to whether they are accepting of swimming as therapy or not. Some cats are fine on an underwater treadmill and never make the transition to swimming. However, other cats take to the water and with motivation from a favourite toy stored in cat-nip or a favourite treat, will gladly perform any task.
conditions. Water provides an ideal environment for performing non-concussive active exercise, and through its natural properties (buoyancy and resistance) it can help improve limb mobility, strength and joint ROM. As the buoyancy of the water decreases joint stress while increasing the metabolic rate it can be very useful for successful weight loss.

Involving owners in physical therapy

The rehabilitation technician/nurse can instruct the owner on a home exercise programme for their cat. It is best to provide written and verbal instructions as well as demonstrations for the client and to ask the client to perform the exercise for you, so that you know they understand the instruction and are doing this correctly.

Osteoarthritis (OA)

Simple ROM and massage techniques can be taught to owners and these can help alleviate muscular pain that is often associated with OA and improve joint mobility. Encouraging the cat to play with different toys is likewise helpful and some cats may be amenable to exercise outdoors on a leash or harness.

Weight loss/obesity

Encourage owners to increase their cat’s activity gradually based on their needs, starting with 5–10 minutes per day with creative and low-intensity activities for sedentary pets (such as walking in the garden). Creativity in activities, such as incorporating food dispensing toys, spreading meals throughout different parts of the house, interactive toys, laser pointers, and electronic mice can also be helpful.

There are several forms of hydrotherapy, including pools and water treadmills. The rehabilitation technician/nurse should accompany the cat into the water to provide assistance and reassurance until it is accustomed to the activity. Some cats may be more accepting of water if it is initially introduced to it in the home environment (bath or sink), as a gradual progression from being bathed to being rehabilitated is often more acceptable. (See Box 1 for tips on introducing cats to the treadmill.)

Postoperatively, hydrotherapy may be employed as soon as the surgical incision has established a fibrin seal (generally 48–72 h post-surgery), although in practice most hydrotherapy with dogs is started 2–3 weeks following surgery.

Conclusions

Physical rehabilitation for cats is different than that for dogs. The plan must be creative, fun, easy to follow and have short intervals for cats. The attention span for cats is much less than that of dogs.

Prior to beginning any rehabilitation, the cat must be examined by the rehabilitation veterinarian, checked to make sure pain is not an issue, observed to ensure that stress is not a factor for the patient and have the rehabilitation veterinarian draw up the therapeutic plan.

The rehabilitation veterinary technician or nurse will most likely be interacting a great deal with the owner, carrying out parts of the therapeutic plan and monitoring comfort for the cat. Feline patients will benefit from a rehabilitation programme just like any patient. It’s all a matter of learning to speak ‘cat’.
References


Online how-to videos
what all cats would want their owners to watch

International Cat Care has produced 16 short videos to demonstrate correct cat care and help owners with various cat care issues.

General
- Apply a spot-on product
- Apply ear drops and clean your cat’s ears
- Apply eye drops or ointment
- Brush your cat’s teeth
- Clip your cat’s claws
- Fit a collar for your cat
- Give subcutaneous fluids to your cat

Giving a cat a tablet
- Two people giving a tablet
- Using a pill popper
- Hiding a tablet in a treat
- Crushing a tablet and mixing with water
- Crushing a tablet and mixing with wet food

Diabetes
- Home blood glucose testing for your cat
- Collect your cat’s urine
- Give your cat an insulin injection
- Test your cat’s urine for substances like glucose and ketones

Available from www.youtube.com/icatcare

isfm
International Cat Care is the parent charity of the International Society of Feline Medicine (ISFM).
Find out more about International Cat Care at www.isfm.org.