State of the art
Hypotension and anaesthesia

A closer look at...
Common cancers in cats

Clinical nursing
Running successful nursing clinics

How to...
Nutritional plans for the hospitalised cat
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Welcome to the October issue of *Feline Focus*. In this issue we have a wide range of topics and hope you find some interesting information to take back to your clinic. Zara Livingstone completes her series on hypotension, explaining how to avoid and manage this common complication of anaesthesia. Next Linda Ryan explains how cancer develops, the common types and how it is managed. She reminds us of the importance of nursing involvement in such cases, not only for the feline patient but also in supporting the owner. Helen Tottey follows up her fabulous webinar with an article on running successful nursing clinics. Catch up with the webinar on our website if you missed it! Finally, Sarah Bolton tells us how to formulate a nutritional plan for hospitalised patients. Do you know how much each cat in your clinic is eating, and how much they should be eating? Nutrition is vital for recovery and getting the calculator out and creating a feeding plan that is constantly reassessed is a must if you have sick cats hospitalised in your clinic.

Thanks for reading and remember that we have a library of back issues and webinars to fulfil all your feline CPD needs!

Best wishes,

Sam Taylor, Veterinary Editor

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*Source: Mills 2001. Evaluation of a novel method for delivering a synthetic analogue of feline facial pheromone (Feliway®) to control urine spraying by cats.
Hypotension is commonly encountered in association with anaesthesia and surgery. Anaesthetised patients may lose the normal homeostatic mechanisms that maintain blood flow to the tissues during hypotension, resulting in organ damage. Clinical examination, correction of fluid volume deficits and avoiding hypothermia may prevent hypotension, but if detected during anaesthesia certain steps should be taken to assess equipment, and correct hypothermia, hypovolaemia and bradycardia. Sympathomimetic drugs may be required, but should be used with care.

Assessment of cardiovascular system (CVS) function is essential during anaesthesia, to ensure adequate tissue oxygen delivery. Many anaesthetic agents have profound adverse effects on the CVS, and many disease states and surgical procedures also have negative effects on the CVS.

As oxygen delivery to the tissues depends primarily upon the cardiac output and the oxygen content of arterial blood, this is not easy to monitor in clinical situations. The next best thing we can use to help monitor tissue oxygen delivery is the mean arterial pressure (MAP). The following equation is derived from combining the equations for arterial blood pressure and cardiac output, to produce a measurement for MAP:

\[ \text{MAP} = (\text{heart rate} \times \text{stroke volume}) \times \text{systemic vascular resistance} \]

This is the second article in a two-part series covering how to troubleshoot hypotension during anaesthesia. Part 1 discussed how and why we monitor blood pressure, its importance during an anaesthetic and how to avoid pitfalls in measurement. See A practical guide to blood pressure monitoring in the anaesthetised cat: 1. Feline Focus 2017; 3(9): 231–238.

Indications for blood pressure measurement

Blood pressure measurement is indicated:

• to help obtain and identify early markers of disease during baseline health checks;
• to monitor in-patients with known or suspected aberrations in blood pressure due to underlying disease;
• in an emergency or critical care setting;
• during an anaesthesia.
Although this equation cannot tell us much about the actual tissue perfusion, measuring the MAP does give us numbers to ensure we have adequate driving pressure behind the blood flow (Table 1).

As part of the homeostatic mechanisms in maintaining cardiac output and blood pressure, the initial response of the body to compensate for decreased MAP is to increase the systemic vascular resistance by vasoconstriction and increased heart rate. If vasoconstriction is profound, this in turn can diminish blood flow to the peripheral tissues, resulting in decreased tissue perfusion despite the patient remaining normotensive. The patient does not become hypotensive until the compensatory mechanisms have failed. When a patient is anaesthetised, the drugs used obtund the normal homeostatic reflexes. Compensatory mechanisms, therefore, do not occur in anaesthetised patients, making hypotension more likely.

### Hypotension in the anaesthetised patient

Hypotension occurs when the MAP is below 60 mmHg, or the systolic arterial pressure (SAP) is below 80–90 mmHg. It is one of the most common complications during general anaesthesia of small animal patients and is a frequent occurrence even in healthy animals, making blood pressure monitoring a fundamental part of good anaesthesia practice.

A recent study reported that significant hypotension (requiring intervention to correct it) occurred in 11.1% (1 in 9) anaesthetised patients.¹

To maintain cerebral autoregulation the MAP needs to be above 50 mmHg, and to maintain renal autoregulation, above 60 mmHg. Therefore, during general anaesthesia the aim is to keep the MAP above 70 mmHg (60 mmHg minimum) and a systolic arterial

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**Table 1: Blood pressure reference intervals in cats, measuring with oscillometry and direct/invasive monitoring**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic arterial pressure</td>
<td>90–160</td>
</tr>
<tr>
<td>Diastolic arterial pressure</td>
<td>50–90</td>
</tr>
<tr>
<td>Mean arterial pressure</td>
<td>70–100 (60 minimum)</td>
</tr>
<tr>
<td>Doppler blood pressure</td>
<td>80–140</td>
</tr>
</tbody>
</table>

**Table 2: Consequences of hypotension on the body**

<table>
<thead>
<tr>
<th>Mean arterial pressure</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 70 mmHg</td>
<td>Potential organ hypoperfusion</td>
</tr>
<tr>
<td>Less than 60 mmHg</td>
<td>May be associated with poor renal function and oliguria (reduced urine output)</td>
</tr>
<tr>
<td>Less than 50 mmHg</td>
<td>Cerebral oxygen delivery is compromised</td>
</tr>
<tr>
<td>Less than 30–35 mmHg (for 2 h or more)</td>
<td>Brain ischaemia occurs</td>
</tr>
</tbody>
</table>

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¹ icatcare.org/felinefocus
Key point

Hypotension is a common complication of small animal anaesthesia, even in healthy patients, making blood pressure monitoring important for every anaesthetised patient. During an anaesthetic the MAP should be maintained above 70 mmHg.

Intraoperative hypotension results in hypoperfusion of vital organs causing inadequate delivery of oxygen and removal of waste products, and can ultimately cause irreversible damage to tissues of the brain, heart and kidneys (Tables 2, 3 and 4). A potentially overlooked consequence of peri-anaesthetic hypotension in cats is blindness, which is caused by reduced cerebral perfusion leading to cerebral and retinal ischaemia; ultimately a lack of oxygen to the brain. The use of spring-loaded mouth gags (Figure 1) can also cause blindness. This is due to reduced perfusion of the cerebral cortex and retina via compression of the maxillary arteries that arise when there is hyperextension of the mouth.2 Thus, these mouth gags should not be used in cats. As an alternative, mouth gags of fixed lengths can be purchased (Figure 2),

<table>
<thead>
<tr>
<th>Pharmacological</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenothiazine: acepromazine</td>
<td>Vasodilation</td>
</tr>
<tr>
<td>Alpha2-adrenoceptor antagonists:</td>
<td>Initial vasoconstriction with increased blood pressure, reflex bradycardia and reduced cardiac output</td>
</tr>
<tr>
<td>medetomidine, dexmedetomidine</td>
<td></td>
</tr>
<tr>
<td>Opioids: methadone, buprenorphine, butorphanol, pethidine, morphine</td>
<td>Histamine release which can cause vasodilation. Reduction in HR</td>
</tr>
<tr>
<td>Induction agents: propofol, alfaxalone</td>
<td>Myocardial depression, peripheral vasodilation, and decrease in HR</td>
</tr>
<tr>
<td>Inhalational agents: isoflurane, sevoflurane</td>
<td>Vasodilation</td>
</tr>
<tr>
<td>Epidural: with local anaesthetics lidocaine or bupivacaine</td>
<td>If the block extends cranially to the thoracolumbar area, the local anaesthetic can block the splanchnic sympathetic nerves. It causes vasodilation of the splanchnic circulation, resulting in hypotension</td>
</tr>
<tr>
<td>Beta blockers: esmolol</td>
<td>Blocking the effects of the hormone epinephrine, also known as adrenaline. The heart beats more slowly with less force, thereby reducing blood pressure</td>
</tr>
<tr>
<td>ACE inhibitors: benazepril, enalapril</td>
<td>ACE inhibitors lower blood pressure by reducing angiotensin II, which is a potent vasoconstrictor</td>
</tr>
</tbody>
</table>
Table 4: Pathological causes of hypotension

<table>
<thead>
<tr>
<th>Hypovolaemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>• dehydration</td>
</tr>
<tr>
<td>• haemorrhage</td>
</tr>
<tr>
<td>• gastrointestinal fluid loss</td>
</tr>
<tr>
<td>• burns</td>
</tr>
<tr>
<td>• relative hypovolaemia due to vasodilation</td>
</tr>
<tr>
<td>• inadequate intravenous fluid therapy</td>
</tr>
<tr>
<td>• endocrine disease</td>
</tr>
<tr>
<td>• sepsis</td>
</tr>
<tr>
<td>• third spacing of fluid; eg, pleural effusion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Obstruction of venous return</th>
</tr>
</thead>
<tbody>
<tr>
<td>• retraction of organs</td>
</tr>
<tr>
<td>• pregnancy</td>
</tr>
<tr>
<td>• gastrointestinal endoscopy and insufflation</td>
</tr>
<tr>
<td>• positioning</td>
</tr>
<tr>
<td>• surgical packing</td>
</tr>
<tr>
<td>• intermittent positive pressure ventilation</td>
</tr>
<tr>
<td>• pericardial effusion</td>
</tr>
<tr>
<td>• tension pneumothorax</td>
</tr>
<tr>
<td>• space occupying tumours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heart conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• bradycardia</td>
</tr>
<tr>
<td>• tachycardia</td>
</tr>
<tr>
<td>• atrial fibrillation</td>
</tr>
<tr>
<td>• ventricular tachycardia</td>
</tr>
<tr>
<td>• atrioventricular block</td>
</tr>
<tr>
<td>• cardiomyopathy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vasodilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• anaphylactic reaction</td>
</tr>
<tr>
<td>• endotoxaemia</td>
</tr>
<tr>
<td>• septicaemia</td>
</tr>
<tr>
<td>• severe metabolic or respiratory acidosis</td>
</tr>
<tr>
<td>• hypoxaemia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metabolic diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>• diabetic ketoacidosis</td>
</tr>
<tr>
<td>• hypocalcaemia</td>
</tr>
</tbody>
</table>
may help correct relative and absolute hypovolaemia, resulting from vasodilation and blood loss during surgery. It is much better to be prepared than trying to place an intravenous line under pressure, in a patient covered with drapes and already suffering from hypotension. It also allows for rapid administration of emergency medications if needed.

Avoid hypothermia
Ensuring normothermia pre-, peri- and postoperatively is essential as the metabolic rate decreases by 10% for each 1°C decrease in body temperature, so drug metabolism/elimination is reduced and recovery from the general anaesthetic may be prolonged. Heart rate tends to slow as temperature decreases due to electrophysiological changes. Along with the bradycardia, blood pressure tends to fall as baroreceptor sensitivity/reflexes are depressed and cardiac output is therefore reduced.

Ways to prevent heat loss include:
- minimising anaesthesia and surgical time;
- ensuring a warm environment from the time the pre-med is given until the patient is standing from the surgery in recovery;
- minimising clipping and wetting of the patient;
- maintaining body warmth with jackets, bubble wrap, heat mats, ‘Hot dogs’ and ‘Bair huggers’;
- drying the patient as much as possible if it gets wet during anaesthesia;
- conserving respiratory tract heat and moisture with the use of heat and moisture exchangers (Figure 3).

Manage pre-existing conditions
Any pre-operative underlying conditions ideally need to be managed prior to general anaesthesia to reduce the chance of hypotension. For example:
- pre-existing cardiovascular disease;
- pre-existing renal disease: try to avoid any further renal insult, fluid therapy is warranted and it is imperative to measure intraoperative arterial blood pressure to maintain normotension;
- endocrine diseases such as diabetes and Addison’s disease (rare in cats) can lead to fluid loss, and may warrant fluid therapy prior to anaesthesia.

Management of hypotension
If hypotension is identified, first confirm the finding by checking the equipment:
- check the cuff is in the correct position;
- check that the correct sized cuff is being used (30–40% of the circumference of limb);
- ensure the limb is at the level of the heart base;
- repeat measurement as it may be an erroneous reading;
- if using oscillometry, double-check blood pressure measurement with a Doppler. Ensure an appropriate trace using high definition oscillometry (HDO) (Figure 4).

Figure 3: Heat and moisture exchanger (HME)
If the readings are accurate, we need to move through the body systems to try and ascertain the cause of the hypotension.

• Check the depth of anaesthesia and ensure the patient is not too deep:
  — palpebral reflex;
  — eye position;
  — jaw tone.

• Consider reducing the vaporizer setting:
  — if there are signs of increased depth of anaesthesia, such as central eye, ventromedially rotated eye with no palpebral reflex and relaxed jaw tone;
  — can the flow rate be decreased?
  — can a local block be performed to the surgical site to provide local anaesthesia and reduce the anaesthetic agent requirement?
  — can any other analgesic drugs be given?

• Check the patient’s temperature:
  — use warming devices if hypothermia is detected.

• Ventilation:
  — if ventilation is being used, positive pressure may be reducing venous return;
  — Reduce tidal volume and increase respiration rate to maintain the patient’s minute volume but decrease the peak inspiratory pressure;
  — ensure optimised oxygenation.

Consider other causes of hypotension
Is it a result of anaesthetic or analgesic agents?
• Reduce vaporiser setting as above;
• Has the patient received acepromazine or epidural with local anaesthetic leading to vasodilation?
• ‘Reverse’ or antagonise drugs, such as alpha2-agonists if bradycardia is thought to be contributing to hypotension;
• Reduce constant rate infusions.

Is the patient hypovolaemic?
• Has the patient lost any blood and if so how much?
• Does the pulse profile change on the pulse oximeter during ventilation indicating volume depletion? The pulse oximeter can be used as well as blood pressure to monitor arterial blood saturation. The pulse oximetry plethysmographic (POP) signal resembles the peripheral arterial pressure waveform.

Key point
Cats are vulnerable to fluid overload and the traditional anaesthetic fluid rates should be replaced by lower fluid rates adjusted according to clinical parameters.
Is the patient bradycardic?
- Is the bradycardia causing the reduction in blood pressure?
- Minimum heart rate of a cat: 90–100 beats per min.
- Care with alpha2-agonists: ‘reverse’ any alpha2-agonists if used first.
- If no alpha2-agonists have been used and the patient has bradycardia affecting blood pressure; treat with atropine or glycopyrrolate.
- Ask the surgeon to stop any stimulation that may influence blood pressure; for example, pressure on the globe causing oculo-cardiac reflex or vagal nerve stimulation.
- Check patient positioning; for example, hyperextension of the neck should be corrected.

Does the patient have a cardiac problem?
- Does the patient have any abnormal heart rhythm that may be causing a reduced cardiac output?
- Treat with appropriate drugs if affecting cardiac output, such as atropine or glycopyrrolate in atrioventricular block.
- Ventilate to control carbon dioxide levels, avoiding high peak inspiratory pressures.

Does the patient need crystalloid fluid therapy or a blood transfusion?
Current recommendations are to deliver less than the historical ‘surgical rates’ of 10 ml/kg/h to avoid adverse effects associated with hypervolaemia, particularly in cats, due to their smaller blood volume compared with dogs. In the absence of evidence-based anaesthesia

Sympathomimetic drugs — are they needed?
Sympathomimetic drugs cause vasoconstriction or increase cardiac contractility (Table 5) and, as such, they should be used with care and full understanding of their effects. In some situations, although the blood pressure can appear better, due to the vasoconstrictive effects of the drugs, the flow through the vessels is actually reduced, reducing oxygen delivery to the vital organ tissues.

Table 5: List of sympathomimetic drugs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ephedrine</td>
<td>Vasopressor, that induces vasoconstriction and thereby elevates mean arterial pressure</td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>Used in conjunction with fluid therapy to treat hypotension secondary to drugs or vasodilation. Causes peripheral vasoconstriction, therefore increasing blood pressure</td>
</tr>
<tr>
<td>Dopamine</td>
<td>Dopamine is a positive inotrope, that increases contractility of the heart and a vasopressor, that induces vasoconstriction and thereby elevates mean arterial pressure</td>
</tr>
<tr>
<td>Noradrenaline</td>
<td>Treats refractory hypotension causing vasoconstriction to increase systemic vascular resistance</td>
</tr>
<tr>
<td>Dobutamine</td>
<td>Used to support myocardial function during anaesthesia when reduced myocardial contractility is thought to be causing hypotension</td>
</tr>
</tbody>
</table>

Figure 5: Some examples of sympathomimetic drugs
fluid rates for animals, it is currently suggested initially starting at 3 ml/kg/h in healthy cats. Rates should be adjusted if other diseases are present such as cardiac disease or renal disease.

Conclusions
Monitoring blood pressure is an essential tool when monitoring a general anaesthetic to improve safety for the patient. Monitoring blood pressure allows you to prevent or treat significant hypotension which, if prolonged and uncorrected, causes reduced tissue perfusion with the potential for end-organ damage.

References
Common cancers in cats

Cancer is common in older cats, and results from the unrestrained growth of cancerous cells. Lymphoma is the most common type of cancer in cats, occurring most frequently in the gastrointestinal tract. Other types of cancer affecting this species include mast cell tumours, carcinomas (lung, thyroid, mammary gland and alimentary tract), squamous cell carcinoma and sarcomas. Grading and staging should be performed to examine the type and extent of the neoplasia, and treatment includes surgery, chemotherapy and radiotherapy. The nurse or technician can provide compassionate care to feline cancer patients and their owners, and be an important source of information on their cat’s disease.

Cancer is the unrestrained growth of cells that destroy normal tissues and body parts, and interrupt how they function. Most cancers are believed to arise through a complex process called multi-step carcinogenesis. This theory is based on the fact that, in the majority of cancers, at least two genetic changes have occurred prior to the induction of malignancy. There are three basic steps in multi-step carcinogenesis

Figure 1: Multi-step carcinogenesis

<table>
<thead>
<tr>
<th>Carcinogens (eg, radiation, infections, chemical agents) act on normal cell</th>
<th>DNA damage</th>
<th>Transformation to cancer cell (may be benign or malignant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic changes</td>
<td>Genetic changes</td>
<td></td>
</tr>
<tr>
<td>Initiation</td>
<td>Promotion</td>
<td>Progression</td>
</tr>
</tbody>
</table>

Figure 1: Multi-step carcinogenesis

Linda Ryan
VTS(Oncology) DipAVN(Medical) KPA-CTP RVN

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(Figure 1). These steps ultimately lead to the evolution of a cancer cell from a normal cell. Initiating agents (carcinogens) cause potentially
A closer look at...

Tumour nomenclature

There are three main groups:

- **epithelial**: glandular or protective (e.g., skin, endothelium)
  - **benign** — suffix: papilloma (e.g., squamous papilloma [wart])
  - **malignant** — suffix: carcinoma (e.g., adenocarcinoma, transitional cell carcinoma, anal sac adenocarcinoma)

- **mesenchymal**: connective tissue (e.g., muscle, bone, fat, cartilage)
  - **benign** — suffix: oma (e.g., lipoma, fibroma)
  - **malignant** — suffix: sarcoma (e.g., osteosarcoma, chondrosarcoma)

- **round cell**: haemolymphatic tissue (e.g., lymphoma/lymphosarcoma, mast cell tumour)
  - **melanoma** — (strictly classes as round cell, but not haemopoietic)

reversible damage in the DNA of the affected cell. If recovery doesn’t occur, promoting agents (initial carcinogens or normal hormones/growth promoters) cause progressive tissue and cellular changes. At which point progressing agents convert an initiated cell, or a cell undergoing promotion, into a cell exhibiting malignancy, capable of developing into a mature neoplasm.

For a tumour to result, the affected cell must be irreversibly altered at least twice — once in the initiation phase and once in the progression phase. The course of progression is irreversible, but it may be a very slow process that does not manifest itself in the animal’s lifetime. These abnormal cells may then proliferate to form a neoplasm (tumour), which is not under the control of normal growth-controlling mechanisms, and may become of clinical significance to the cat.¹

Tumours may be diffuse, or form a distinct mass, which may or may not metastasise, and/or cause clinical signs due to the location in the body and/or space-occupying nature. Any tumour may affect any animal, and in most cases, individual causes of cancer are not known, although environment, genetics, health and illness may all influence whether/when a cat will develop cancer. Tumours have a standard nomenclature to help classify and name them (see box).¹

How common is cancer in cats?

While cats are less commonly presented and treated for cancer at the veterinary practice than dogs, it is widespread in cats of over 8 years

Key point

The most common type of cancer in cats is lymphoma, a malignant round cell tumour arising from lymphocytes. It can occur in many locations but gastrointestinal lymphoma is the most frequently diagnosed.
old, with up to one in four older cats being affected. Early signs may be missed, meaning that cats are unwell at presentation. This is because subtle signs may not be seen in pets that spend much time alone and/or outside; as well as cats’ species-typical behaviour of being quiet and still, and not showing obvious signs of illness — until coping is impossible, at which point owners notice a problem.2–4

**Common cancers in cats**

**Lymphoma**

Lymphoma (or lymphosarcoma) is a malignant round cell tumour arising from lymphocytes.

Lymphoma can occur in any breed, at any age, but is more commonly found in middle-aged to older patients. It may be diagnosed in any body tissue. Lymphoma is the most common cancer diagnosed in cats, with gastrointestinal, or alimentary (ie, the stomach or intestines), lymphoma being the most prevalent form in cats (Figure 2).

The multi-centric form, involving some/all lymph nodes, although common in dogs, is not as prevalent in cats. Other common sites for lymphoma in cats include extra-nodal tissues, such as the nasal cavity (Figure 3), mediastinum and kidneys, with the brain or spinal cord, bones and heart being diagnosed less often. Lymphoma of the spleen and/or bone marrow is often part of a multi-centric form, and can be associated with leukaemia.

Lymphoma has historically been associated with the feline leukaemia (FeLV) and feline immunodeficiency (FIV) viruses. With increased awareness (ie, testing, management and vaccination) FeLV-related cases are now less common.2,5–7

**Mast cell tumour**

Mast cells are part of the normal immune system and are found particularly in the skin, respiratory and intestinal tracts. Mast cells carry granules containing biologically active compounds including histamine and heparin. This type of round cell tumour is the second most common skin-associated cancers in cats, and may be benign or malignant. Cutaneous mast cell tumours (MCTs) in cats are more frequently found to behave in a benign way, whereas MCTs of the
internal organs (commonly spleen and intestines) may behave in an aggressive manner.

MCTs are a disease of middle-aged or older cats, but younger cats may also be affected. The cause is generally unknown, but some breeds appear to be at increased risk of developing MCTs (eg, Siamese).

Skin lesions may appear red and raised, and may be itchy, resulting in Dariers’ sign (‘wheal and flare’) when manipulated. These cats are usually well at presentation, and surgery is often curative. Some cats may develop multiple skin MCTs (Figure 4) during their lifetimes, either as independent events or appearing simultaneously.

Figure 4: A cat with multiple mast cell tumours on its head area

Compared with dogs, visceral MCT is more commonly diagnosed in cats. It carries a poorer prognosis, with cats being unwell at presentation. These cats show two age associations (ie, affected when either young or old [more commonly]), depending on the tumour pattern. 2,7,9

Carcinoma
Carcinoma is a malignant tumour arising from epithelial cells. Adenocarcinomas involve glandular tissue. Carcinomas and adenocarcinomas represent a diverse group of tumours and have different presentations, behaviours and responses to therapy.

Common sites of carcinomas include the lung, thyroid, mammary glands, alimentary tract and nasal cavity. 2,7,8,30

Intestinal adenocarcinomas
Intestinal adenocarcinomas are one of the three most commonly diagnosed gastrointestinal tumours in cats (between lymphoma and MCT in prevalence). Intestinal adenocarcinomas most commonly occur in older cats, with a possible male predilection. The signs are those of gastrointestinal disease (eg, vomiting ± haematemesis, anorexia, lethargy, weight loss and anorexia, often with a palpable abdomen mass). 2,7,10

Squamous cell carcinoma
Squamous cell carcinoma (SCC) is a cancer often, but not exclusively, involving the skin. White or light-coloured cats, are susceptible to SCC. So called ‘solar-induced’ SCC most commonly develops in areas of sparse hair coverage that are

Figure 5: A cat with bilateral squamous sarcoma of the pinnae
exposed to the sun, in particular the ear tips and nose. Older cats are most commonly affected and initial signs include reddened, flaky, scaly, inflamed skin with associated hair loss. Such lesions later develop into ‘in-situ’ forms with characteristic crusting and ulceration of a full blown tumour (Figure 5).1,8,13

SCC is also commonly diagnosed in the oral cavity, where it behaves malignantly.2,7,8

**Mammary gland tumours**
Mammary gland tumours are the third most commonly diagnosed tumour in cats, and the most common in female cats. Spaying prior to the first oestrus offers the best protection from this type of cancer, although the preventive effect of neutering is not as great in cats as it is in dogs.

Over 80% of feline mammary tumours are aggressive and malignant and may metastasise. Of those, more than 80% are adenocarcinoma. At the time of presentation, most have metastasised, and, therefore, even with complete surgical excision, the prognosis may be guarded. Without treatment, masses often will become inflamed and ulcerate, causing pain and reducing quality of life.2,7,8,11

**Key point**
Entire females are thought to have seven times the risk of mammary tumours of spayed females.
Leukaemia
Leukaemia, round cell cancers involving the bone marrow and blood, may be acute or chronic and involve any blood cell type. It is generally classified into lymphoid and myeloid, acute or chronic, forms. Most patients are middle-aged or older, although younger animals are sometimes affected, especially with acute leukaemia. FeLV is now less commonly associated with leukaemia, although it is routinely tested for in leukaemic cats.

In acute leukaemia, undifferentiated blast cells multiply in the marrow until they make up most of the cells present. The malignant blast cells do not mature normally or function usefully. Typical signs include anaemia, leukopenia and thrombocytopenia. Patients present very ill and the prognosis is poor.

In chronic leukaemia, the malignant cells do mature into normal-looking cells and the bone marrow usually produces normal blood cells. The disease may be discovered incidentally. It is common for cats with chronic lymphocytic forms of this disease to be managed long-term on oral, at-home medications, with a normal life expectancy.

Finding out what it is, where it is and where it’s got to
In terms of diagnosis, grading and staging (see box) will provide information on tumour type and its extent as well as on expected survival, metastatic rate, and disease-free interval or speed of local recurrence. It will aid decision-making and give an idea of prognosis. Multiple modalities are used in the diagnosis of cancer, including cell/tissue sampling, radiography, ultrasound, endoscopy, and advanced imaging.

Grading and staging
• grading: this is a histological assessment of the degree of malignancy and may include the degree of cell differentiation, mitotic index, degree of cellular or nuclear pleomorphism, amount of necrosis, invasiveness, local stromal reaction, lymphoid response. Tumours in which grade may be predictive of biological behaviour include MCT, lymphoma and mammary gland carcinoma.

• staging: this attempts to define the extent of the primary tumour and the degree of metastasis. Staging protocols vary, but may include full haematology, biochemistry and urinalysis, clotting profile (eg, haemangiosarcoma ± MCT), lymph node aspirate or biopsy, bone marrow aspirate or biopsy (eg, in suspected lymphoma, MCT, leukaemia), tumour biopsy, endoscopy, imaging (radiography, ultrasonography, MRI, CT) of the primary tumour and areas of expected metastasis.

Key point
Tumour grading and staging determines the extent of the tumour and if it has metastasised.

Treatment, nursing and owner support
Once the tumour type, and its extent/effects within the body, have been identified, then a prognosis can be provided to the client and a treatment protocol put in place. Treatment of cancer is aimed at maintenance of optimal quality of life, and may include cure in some types of cancer. The three most important treatment options used...
in veterinary oncology are surgery, radiotherapy and chemotherapy.\textsuperscript{2,14}

- **surgery:** this may be diagnostic (collection of biopsy samples) or therapeutic (removal or debulking localised solid tumours); for example in the case of (adenoc)carcinomas, MCT or sarcomas.\textsuperscript{2,14}

- **radiotherapy:** used alone or in conjunction with surgery and chemotherapy, to treat local or diffuse disease. Radiation may be used with palliative or therapeutic intent. It most often used to treat smaller or de-bulked localised tumours.\textsuperscript{2,14}

- **chemotherapy:** used to treat systemic cancer, (eg, lymphoma, leukaemia or MCT) and/or as an adjunct to surgery or radiation (to treat microscopic disease), or as neoadjuvant therapy prior to surgery or radiotherapy (eg, in FISS).\textsuperscript{2,14}

- **newer therapies:** tyrosine kinase inhibitors and immune therapies, for example, allow for more targeted approaches and are used in a variety of tumour types. They may be used alone or in conjunction with other therapies, although none are licensed in cats*.\textsuperscript{2}

- **palliative care:** analgesia, hydration maintenance, appetite stimulation, antiemesis, and paying attention to pre-existing or concurrent conditions. Palliation may be administered in conjunction with the other modalities, or as a stand-alone care plan, aimed at simply improving/maintaining a cat’s quality of life for as long as possible.\textsuperscript{2,14}

Whatever decisions owners make, a trained and dedicated veterinary team can provide compassionate care to feline cancer patients and their owners. Following the diagnosis of their cat’s cancer, many owners will undergo a range of emotions, they may have many questions and need ongoing support, and the cat is likely to need ongoing healthcare. Nurse clinics can be extremely helpful, providing care and support for owners, alongside the patient’s treatment protocol (Figure 6). These clinics are aimed at keeping cancer-bearing cats enjoying great, long-term quality of life and should provide advice on achieving this, considering the patient’s life-stage and clinical condition.

Understanding common tumour types in cats, their likely prognoses and response to therapy; diagnostics (ie, grading and staging); and treatment options (eg, surgery, radiotherapy, drug therapy), as well as their side effects, allows veterinary nurses and technicians to communicate effectively with owners on the cat’s specific disease.\textsuperscript{2,4}

*Drug licensing rules may vary between countries.
A closer look at...

References


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Running successful nursing clinics can be challenging. The right nurse needs to be the driving force behind the clinics, and involve the entire veterinary team. Excellent communication is vital, to ensure the receptionists and clinicians understand which patients to refer to your clinic. Marketing is required, and clinics should not be overpriced, as this may deter clients. Successful feline nurse clinics are possible, with hard work and a supportive team.

We used to run clinics but we don’t anymore because they didn’t work. If this sounds familiar, have you ever wondered why this has happened for you but not for others whose clinics are busy? This article is going to try to help ensure that your clinics are the successful ones and do not fail due to lack of attendance.

Where do we start?
So, where to start? Choosing the right person is crucial to successful clinics. I do not mind admitting that I was not the most clinically driven veterinary nurse (VN) and an anaesthetic longer than a cat spay would bore me, but put me on reception dealing with people, and I could stay there all day. Likewise, some nurses would prefer hours in scrubs or in the kennels caring for cats than be anywhere near reception, and then there are those who quite like the variety of doing a bit of both. When deciding on how your clinics will run, you need to choose the person or people who want to do them and not force those whose skills are best spent in other areas of the practice.

Once you have the nurse or nurses in mind, what about training? Vets spend years ‘seeing practice’ and observing consultations as well as receiving specific training in this area, but as VNs (or technicians) we generally don’t have this in our curriculum.

Successful clinics rely on good communication skills and these skills can bring in more business for the
Clinical nursing

practice, as well as increasing uptake of products or procedures (Figure 1). Therefore, investing in a nurse consulting course (for example, in the UK, the Onswitch Nurse Consulting at http://www.onswitch.co.uk/training/nurse-consulting-7-steps/) will help build confidence as well as success.

Motivating the whole team
Now you have the person, you need the clients and their cats. Ensure the whole team (vets, other nurses and receptionists) are aware of the clinics you are running, and which cases should be referred to you. Owners bring their cats to the practice for many reasons, and some of these may pass over to the nurse consulting list from the vets, so it is vital that your customer care team are briefed. It is advisable to have a meeting to discuss your aims for the new clinics and answer any questions that the reception team have. These meetings can be very beneficial as it will give you the opportunity to show your enthusiasm and desire for the clinics to work and explain why the nurse clinics are important to the client, the cat and the business.

Making appointments
During this meeting, you can discuss the logistics of how the appointments will be allocated. To begin with, you will likely develop your own clientele via vet referral, but later the reception team will need to be able to identify cases best seen in a nurse clinic, rather than a standard veterinary appointment. Mistakes here can lead to frustrations on all sides — me as I was trying to build my relationship with the client, the vet who had passed the case on and didn’t have the time to talk about diet, for example, and the reception team who felt they were ‘getting things wrong’. Discussing protocols early on, will help to avoid any issues.

Preparing your consultation room
Once you have the team on board, and have set your clinic protocols, is your room ready? It is easy to look at a consulting room and not see it from the client’s or cat’s perspective. Go into the room that you will be using and think about how you hope to use it. This may sound odd, but one benefit of nurse clinics is that owners tend to find it easier to talk to us and ask the questions they wouldn’t ask the vet. Also, as the aim is to bond the client with the practice, they need to feel comfortable and a cold consulting room does not help that. I was lucky enough to have my own room and we painted it a different colour, put some chairs in for owners to sit on and put posters and leaflet dispensers on the wall so that educational materials were on hand. If you are not able to have a

Figure 1: Finding the right person to run the clinics is important. You will need enthusiasm and training. (Photograph courtesy of Richard Murgatroyd)
designated room, you will still need to make sure the room can somehow look a bit more inviting to the client and cat (Figure 2).

The use of a Feliway (Ceva) diffuser and towels for cats to sit on can be very helpful, as is making sure you have cat scales, small nail clippers and other cat-specific aids in the room, avoiding trips in and out of the room to fetch equipment. A lockable door helps prevent escapes so you can confidently allow the cat to explore as you chat to owners.

**Timing of nurse clinics**

The time of your clinics are important too, but in busy practices you may have little choice but to use the room outside of other clinic times. These times are generally not owner friendly, which may be a barrier to attendance. In this frustrating situation, present other ideas to colleagues; for example, offer your cat clinics after the vet has finished consulting, or over lunchtimes or other breaks. This would have the added advantage

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**Recruiting clients**

Think about how you can tell clients about your clinic, tips include:

- Ask receptionists to book newly registered kittens an appointment with you, perhaps before or after first vaccination appointments.
- Put information on clinics on your website and social media.
- Ask vets to refer senior cats to your clinic for blood pressure assessment and discussion of geriatric cat care.
- Ask vets to refer cases to you that would benefit from more time and discussion; eg, cats with idiopathic cystitis, diabetics and any overweight animals.
- Promote nurse clinics in other routine appointments such as postoperative checks, dressing changes and repeat injections.
- Add a note to booster reminders (whether electronic or paper based) about nurse clinics.
- Share client testimonials, for example on social media or in newsletters, to show how the clinics have helped cats in your care.
- Identify, using databases, key client groups that would benefit from nurse clinics.

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**Key point**

Spending time with new kitten owners can be an important use of nurse clinics. Receptionists should be directing these new clients to you, perhaps combining your appointment with first vaccinations.
that you would not have dogs in the waiting room and the vet can still be in the building to call on should you need help. As a lot of clients would come as late as they could to see you, coming at the end of evening surgery may be a solution.

**Appropriate pricing**
Another consideration is pricing. Free or chargeable is an important decision, as over-pricing will deter clients; however, your skills are of value. The author’s opinion is that nurse clinics should be a mixture of both. If everything is charged for, clients may seek alternative advice (eg, online or pet shops), so kitten checks, nutrition advice or blood pressure checks to compliment a vet appointment need not be charged. However, procedures such as nail clips and other specific treatments such as wound care, or diabetic and kidney monitoring, should not be given away.

You could consider packages where clients pay a fee and then receive a certain amount of nurse appointments, with it made clear that any medical tests are charged for at your normal rate. Or, depending on the type of clinic, the package price could include blood test or blood pressure monitoring. I started a ‘7-up senior clinic’ that was priced as a package which included the initial vet and nurse appointment including a blood test, and then a 6 monthly nurse appointment and urine test for a set discounted fee. Often, I would interact with the client more frequently, but as the nurse appointments were included in the package, I felt clients came to me instead of waiting until a problem became worse.

Whatever you decide to do, this has to be made clear to the practice team as well as the clients, as uncertainty and inconsistent pricing can lead to complaints.

**Cat friendly clinic**
Owners may perceive that visiting the clinic is stressful and this may deter them from attending appointments with you. Becoming a Cat Friendly Clinic, if you are not already, shows clients that it need not be stressful and will encourage them to attend nurse-led clinics. See www.catfriendlyclinic.org.

**Conclusions**
Sharing knowledge and promoting what we do to help cats and their owners will ensure your clinics are successful, but I hope I have shown that busy nurse clinics require a team effort, training and planning. With these, and a lot of motivation and hard work, you will not have to talk about those clinics you ran that no-one came to.

To view Helen Tottie’s webinar on ‘Running successful nursing clinics’, go to the members’ area at www.icatcare.org/nurses and follow the webinar links.

**Key point**
Pricing of nurse clinics should be carefully considered. Over-pricing will deter clients, but your skills should not be given away for free. Consider packages, combining with veterinary consults and discounted fees.
Developing a nutritional plan for the hospitalised cat

Nutritional management of the anorexic hospitalised cat has been identified as suboptimal, with inpatients not receiving their daily calorific requirements. Steps should be taken to include nutritional assessment and formation of a nutritional plan in nursing care plans for every hospitalised feline patient. This includes assessment of energy requirements, and creation of a feeding plan to meet the cat’s needs.

Many hospitalised cats will not be receiving enough food to meet their nutritional needs.¹ This may be due to a lack of voluntary food intake because of illness, absent or vaguely written feeding plans and time constraints.² Sick cats are often not considered in urgent need for nutritional support, and stabilising their condition is considered more of a priority; however, it is these patients that are at great risk of becoming malnourished during hospitalisation (Figure 1).³ The consequences of poor nutrition are significant for the patient and include insulin resistance, muscle wastage, poor immune system function, impaired wound healing and hepatic lipidosis.⁴

Calculating energy requirements
In order to provide adequate nutrition, resting energy requirements (RER) should be calculated and recorded. A plan for how to provide this RER can then be made.

Calculating resting energy requirements (RER, see Figure 2) identifies the required number of calories that a patient needs to maintain homeostasis while resting.³

For patients weighing more than 2 kg:

\[ \text{RER} = 30 \times \text{body weight (kg)} + 70 \]

For patients weighing under 2 kg:

\[ \text{RER} = \text{body weight (kg)}^{0.75} \times 70. \]

A calculation of \( \text{RER} = \text{body weight (kg)} \times 50 \)

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Key point
Many hospitalised cats are not getting enough nutrition, slowing recovery and affecting healing and immune function.
How to...

**Step 1**
Calculate RER*  
BW >2 kg  
RER =  
(BW x 30) + 70  
or  
BW <2 kg  
RER =  
(BW)0.75 x 70  
*BW expressed in kg

Daily kcal =

**Step 2**
Calculate proportion of RER to be fed per day, usually 100%  
(after prolonged inappetence, or for tube-fed patients feed ⅓ RER day 1, ⅔ day 2 and 100% RER on day 3)

Daily kcal =

**Step 3**
Identify kcal per g/ml/cup of diet to be fed

kcal per g/ml =

**Step 4**
Calculate the number of g/ml/cup required per day  
Daily kcal (from step 2) ÷ kcal per g/ml/cup (from step 3)

g/ml per day =

**Step 5**
Calculate the number of g/ml/cup required per feed  
Total quantity of food (from step 4) ÷ number of feeds per day

g/ml per feed =

Figure 2: Calculating daily energy requirements and food intake

in cats has also been described. The dilution of food with water to feed via tube feeding methods should be taken into consideration when calculating the patients’ nutritional requirements.

**Illness factors**
Previously, an illness factor of 1.0 to 2.0 was taken into consideration for different conditions and injuries. This is no longer practised due to the potential risk of overfeeding patients and causing complications that potentially increased mortality. As feeding to ideal body weight could result in overfeeding, many recommend feeding to current body weight and closely monitoring response (ie, weight gain).

**Dietary requirements**
As obligate carnivores, cats have specific nutritional requirements: high protein, moderate fat and low carbohydrate, certain amino acids and B vitamins. For adult cats, 6 g protein per 100 kcal is required, which is estimated to be 25–35% of the total energy requirements. This should be reduced in patients with hepatic encephalopathy and severe azotaemia to 4 g per 100 kcal. Diet selection may be influenced by feeding method (eg, tube size).

**Recording food intake**
It is important to record the RER and how much the hospitalised cat is eating, to identify cases requiring interventions such as feeding tube placement.

**Conclusions**
Feeding plans are underused. Nurses should be involved in creating individualised nutritional plans and implementing techniques to encourage food intake.

**References**

*Tip*
Don’t introduce long-term prescription diets while cats are hospitalised as they may develop aversions to the diet.
2018 Calendar

International Cat Care’s much-loved charity calendar is back for another year, with a new theme – Street Cats. This A4-sized landscape calendar (opens to A3 portrait style) features images of street cats (also known of as feral cats, stray cats or community cats) from all over the world which capture the character of cats surviving without owners and reflect the reality of a life on the streets.

All proceeds go to support International Cat Care’s work in improving the health and welfare of cats worldwide.

Order online at: icatcare.org/shop or call +44 (0)1747 871872