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SPECIAL ARTICLE

2022 ISFM Consensus Guidelines on Management of the Inappetent Hospitalised Cat

Samantha Taylor
BVetMed(Hons), CertSAM, DipECVIM-CA, MANZCVS, FRCVS
*Panel Chair**
International Society of Feline Medicine, Tisbury, Wiltshire, UK

Daniel L Chan
DVM, DipACVECC, DipECVECC, DipACVIM (Nutrition), FHEA, MRCVS
Department of Clinical Science and Services, Royal Veterinary College, North Mymms, Hertfordshire, UK

Cecilia Villaverde
BVSc, PhD, DipACVIM (Nutrition), DipECVCN
Expert Pet Nutrition, Fermoy, County Cork, Ireland

Linda Ryan
BSc (Hons), VTS (Behaviour, Oncology), DipAVN, KPA-CTP, RVN, CCAB
Inspiring Pet Teaching, Fordingbridge, Hampshire, UK

Franck Peron
MSc, DVM, PhD, DipECAWBM–AWSEL
Royal Canin, Research Center, Aimargues, France

Jessica Quimby
DVM, PhD, DipACVIM
Department of Veterinary Clinical Sciences, Ohio State University, Columbus, OH, USA

Carolyn O'Brien
BVSc, MVetClinStud, PhD, FANZCVS
Melbourne Cat Vets, 157 Westgarth Street, Fitzroy, Australia

Serge Chalhoub
BSc (Hons), DVM, DipACVIM (SAIM)
Faculty of Veterinary Medicine, University of Calgary, Alberta, Canada

*Corresponding author:
sam.taylor@icatcare.org

Practical relevance: Inappetence may have many origins and, as a presenting sign or observation in the hospitalised patient, is common in feline practice. Nutritional assessment of every patient is encouraged, to identify the need for, and appropriate type of, intervention indicated. The impact of malnutrition may be significant on the feline patient, perpetuating illness, delaying recovery, slowing wound healing and negatively impacting gut health and immunity. Delayed intervention may result in the cat's deterioration; hence prompt control of contributing factors such as the underlying illness, pain, nausea, ileus and stress is vital to optimise voluntary food intake. Management is multimodal, comprising reduction of stress, medications and assisted nutrition in the form of tube feeding or parenteral nutrition. Use of antiemetic, analgesic, prokinetic and appetite stimulant medications may restore appetite, but placement of feeding tubes should not be delayed. Feeding tubes are generally well tolerated and allow provision of food, water and medication with minimal stress, although clinicians must be aware of complications such as stoma site infections and refeeding syndrome.

Clinical challenges: Cats are vulnerable to malnutrition owing to their unique metabolism and specific nutritional requirements. Moreover, their nature as a species means they are susceptible to stress in the hospital environment, which may result in reduced food intake; previous negative experiences may compound the problem. In particular, an inappropriate clinic environment and/or handling may cause or exacerbate inappetence in hospitalised patients, with negative impacts on recovery. Postponing interventions such as feeding tube placement to await improvement, owing to clinician or caregiver apprehension, may hinder recovery and worsen nutritional deficits.

Evidence base: The 2022 ISFM Consensus Guidelines on Management of the Inappetent Hospitalised Cat have been created by a panel of experts brought together by the International Society of Feline Medicine (ISFM). Information is based on the available literature, expert opinion and the panel members' experience.

Keywords: Feeding tubes; naso-oesophageal; nasogastric; oesophagostomy; gastrostomy; hyporexia; nutritional assessment; nutritional support; refeeding syndrome; appetite stimulants; anorexia

Introduction

Inappetence is a common presenting sign,[1] as well as a frequently observed complication of hospitalisation,[2] in feline patients. Suboptimal nutrition may have many negative effects on cats, in particular, given their higher protein requirements compared with other species, as well as other metabolic adaptations.[3] Additionally, hospitalised cats are vulnerable to stress, which may impact appetite with consequences on recovery from illness, wound healing and immunity.[4] Aside from stress and the underlying pathology, there may be many other factors contributing to a cat's reluctance to eat. Pain, nausea and ileus must all be managed in order to improve the cat's food intake, and many strategies are also applicable to outpatients.[5] Nutritional assessment is a vital part of case management, with implications for treatment and prognosis;[6–8] and early intervention to encourage voluntary food intake or provision of support with feeding tubes can improve outcome.[3,5]

These guidelines aim to provide practitioners with tools to identify cats in need of nutritional support, and guidance on how and when to intervene, so that their hospitalised feline patients can avoid the negative consequences of poor nutri-

ISFM welcomes endorsement of these guidelines by the American Association of Feline Practitioners (AAFP).

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tion. Accompanying these guidelines are two guides and a video to support clients caring for cats with a feeding tube; and two videos on feeding tube placement and management, which have been created to provide support for veterinary staff (see Appendices 1 and 2, page 640; also available at bit.ly/inappetentcattoolkit).

Unique nutritional and energy requirements of cats

Feline nutritional requirements

Cats require nutrients and energy from their food to survive and thrive,[9] and while some nutrients can be synthesised from precursors (non-essential), others must be provided by the diet (essential). A complete diet is one that provides all essential nutrients in adequate amounts to prevent deficiencies or excesses. For commercial diets, there are industry recommendations and sometimes regulatory guidelines that define what a complete diet is; relevant bodies include the Association of American Feed Control Officials (AAFCO)[9] and FEDIAF,[10] the trade body representing the European pet food industry. Nutrients can be classified as macronutrients, or as micronutrients (vitamins and minerals). Macronutrients include protein, fat, digestible carbohydrates and fibre. Protein, fat and digestible carbohydrates also provide energy,[11] with fat providing more than twice the amount of metabolisable energy per gram (8.5 kcal or 35.5 kJ) compared with protein and carbohydrate (3.5 kcal or 14.6 kJ).

Manufacturers have to declare on the cat food label if the diet is nutritionally complete, but it is not easy to determine this from the nutritional information alone, as what is listed is very limited. Cats require about 40 essential nutrients (Table 1), and typical pet food labels are only mandated to list a few (eg, protein, fat) and provide no data on digestibility or bioavailability. For therapeutic veterinary diets, product guides provide more information and nutrients are usually presented on an 'as fed' and calorie basis, the latter being more helpful when comparing diets, as it allows direct comparison between diets differing in moisture content and energy density. Some therapeutic veterinary diets might not meet all nutrient requirements established by AAFCO/FEDIAF owing to their nutritional strategies to manage disease.

Cats' nutrient requirements differ from those of dogs, both quantitatively and qualitatively. Requirements also vary depending on the life stage of the cat. Cats are strict carnivores and some of their nutritional peculiarities might be related to their evolution as hunters (Figure 1).[12] For example, cats require higher amounts of protein than dogs (and people). A lack of enzymatic adaptation to dietary protein levels,[13] meaning that the rate of protein breakdown does not adjust according to reduced protein intake, has been proposed to explain these high requirements. The typical prey of cats is low in starch and high in protein,[14,15] and it has been hypothesised that the high protein needs are in part to cover glucose requirements via gluconeogenesis.[16] Protein requirements for critically ill cats have not been established, but a common recommendation is to provide 60–80 g/1000 kcal.[17,18] This is higher than minimum maintenance protein requirements, likely due to factors such as increased protein losses or altered metabolic and inflammatory pathways.[19] It is postulated, therefore, that the high protein and amino acid requirements are intended to minimise lean mass catabolism during illness.

Despite this high protein requirement, cats are metabolically flexible[20] and can adequately metabolise different dietary macronutrient profiles, provided that minimum requirements are met. Also, while carbohydrates are not essential, cats are capable of digesting and utilising dietary starch, as long as it is adequately processed and provided within an adequate range.[21]

Other nutrients that are exclusively found or more abundant in animal tissue are essential for cats. For example, cats cannot adequately use beta-carotene (plant based) as a source of vitamin A and require dietary retinol. Moreover, cats have a very low delta-6-desaturase enzyme activity, which limits their fatty acid metabolism; therefore, arachidonic acid is an essential nutrient. Taurine is also essential in cats and most abundant in animal tissue (especially organs), whereas dogs can synthesise it from sulfur-containing

Table 1 Essential nutrients required in the diet of cats[11]

Type	Nutrient
Protein and amino acids	Protein, taurine, methionine, phenylalanine, arginine, lysine, histidine, tryptophan, threonine, leucine, isoleucine, valine
Fats and fatty acids	Omega 6 (linoleic and arachidonic acids) and omega 3 (eicosapentaenoic and docosahexaenoic acids)
Fat-soluble vitamins	Vitamins A (retinol), D (cholecalciferol), E and K
Water-soluble vitamins	Thiamine, riboflavin, pantothenic acid, pyridoxine, niacin, cobalamin, folic acid, biotin, choline
Minerals	Calcium, phosphorus, sodium, potassium, magnesium, chloride, iron, copper, zinc, manganese, selenium, iodine

Cats have some nutritional peculiarities related to their evolution as hunters, such as a high protein requirement.

Figure 1 Cats have higher protein requirements than dogs and humans, likely related to their evolution as hunters. *Image courtesy of Sam Taylor*

The veterinary team must be very careful when feeding hospitalised critically ill cats to safely promote calorie and nutrient intake while minimising risks.

amino acids. While vitamin D is an essential nutrient in both dogs and cats, there are additional challenges for cats; namely cats extract dietary vitamin D more efficiently from animal sources (cholecalciferol) than from plant-based ergocalciferol.[22] It is important to note that the fact that cats are strict carnivores does not mean they can survive on meat alone (especially skeletal meat). Nutritional imbalances will develop in cats fed in this manner.[23,24]

Feline energy requirements

Energy requirements of cats vary depending on several factors, such as age, life stage, breed, activity level and neuter status.[11,25] Requirements can be estimated with formulas, and there are different equations depending on the information source. As all estimates are associated with varying degrees of error,[26] they should all only be considered a starting point. Energy requirements can be expressed as maintenance energy requirements in adults or daily energy requirements, and the units are kcal or kJ per day. Resting energy requirements (RER) approximate the basal metabolic needs, important for basic functions, and are commonly used to estimate energy needs of hospitalised cats on cage rest.[6]

If energy needs are not met, cats are at risk of undernutrition, which has negative consequences on outcomes. Excess calorie provision can result in overweight and, in critically ill patients (even if underweight), can increase the risk of complications such as hyperglycaemia, vomiting and diarrhoea.[27] Therefore, the veterinary team must be very careful when feeding hospitalised critically ill cats to safely promote calorie and nutrient intake while minimising risks.

Physiology of starvation

When cats are underfed, there is a metabolic response to ensure provision of nutrients for basic functions using body reserves. This response is different when it happens in healthy animals without access to food ('simple starvation') compared with hospitalised animals, where undernutrition is secondary to decreased food intake and altered metabolism associated with disease ('stressed starvation').[1,28]

Simple starvation

In healthy animals, dietary nutrients are used to meet immediate needs, sparing endogenous fuels stored as glycogen and adipose tissue. Excess energy can be stored as fat. When there is food deprivation, the use of endogenous fuels is required to maintain body functions. Over time, there is a shift from using mixed sources (glycogen, protein, fatty acids) to using fatty acids as a primary fuel source, and a simultaneous decrease in the basal metabolic rate to conserve resources (such as lean body mass). Glycaemia will be maintained via hepatic glycogen (glycogenolysis) and, when these stores are depleted, gluconeogenesis, using substrates resulting from the catabolism of adipose (glycerol) and lean tissue (glycogenic amino acids, lactic acid and pyruvate). Glucose can also be recycled – with energy cost – to ensure provision for glucose-dependent tissues. Some of these tissues, like the brain, can adapt to using ketone bodies as an energy source.

Stressed starvation

Hospitalised cats usually have access to food but can have a reduced or absent appetite. Such patients may be in a hypermetabolic state, induced by inflammatory mediators and stimulation of the sympathetic nervous system.[29,30] This can increase energy expenditure and proteolysis, leading to a negative energy and nitrogen balance, with no adaptive reduction in the metabolic rate. Despite this effect on energy needs, overall energy expenditure of hospitalised cats is usually lower than maintenance, likely due to a reduction in physical activity during cage rest. However, the accelerated loss of lean body mass can negatively affect immune function, wound healing and, potentially, overall survival.[31,32] The specific disease(s) of the patient will also influence the type and degree of metabolic and hormonal alterations. Nutritional support can help to provide substrate and energy to the patient, but disease management is required to reverse the hypermetabolic state.

Inappetence – a common presentation

Inappetence is a common presenting sign of a variety of clinical conditions,[1] and may be the first sign noted by caregivers and may prompt veterinary assessment. Inappetence is reported as the third most common reason for presentation of a cat at a veterinary clinic.[33] Among ill, hospitalised cats, inappetence is even more frequently encountered.[3] Inappetence is sometimes also termed 'hyporexia', describing reduced nutritional intake. Anorexia indicates a complete lack of nutrition and zero food intake.

Common causes of inappetence in cats

- Pyrexia (eg, infectious or inflammatory disease)
- Anosmia or reduced sense of smell (eg, nasal disease, neurological disease)
- Gastrointestinal disease (eg, inflammatory enteropathy, such as inflammatory bowel disease, oesophagitis)
- Pancreatic disease (eg, acute or chronic pancreatitis, pancreatic neoplasia)
- Liver disease (eg, neutrophilic cholangitis, lymphocytic cholangitis)
- Urinary disease (eg, acute or chronic kidney disease, ureteral obstruction, feline lower urinary tract disease)
- Respiratory/cardiac disease (eg, congestive heart failure)
- Endocrine disease (eg, diabetic ketoacidosis, hyperaldosteronism)
- Neurological disease (eg, intracranial disease; also functional difficulties in prehension and swallowing)
- Orthopaedic disease (eg, pain due to degenerative joint disease)
- Immune-mediated disease (eg, immune-mediated haemolytic anaemia)
- Haematological conditions (eg, anaemia)
- Neoplasia (eg, lymphoma, carcinoma)
- Medication effects (eg, polypharmacy, bitter medications, adverse medication effects, medication interactions)
- Food aversion
- Dietary factors (eg, behavioural aversion to food type or texture, reduced palatability of food)
- Constipation (eg, due to orthopaedic pain, anatomical factors or chronic dehydration)
- Dehydration and electrolyte abnormalities (eg, chronic kidney disease)
- Stress (eg, noisy environment, proximity to dogs or other cats)
- Pain (multiple underlying causes, exacerbated by stress)

Medications associated with inappetence[34]

- Many antibiotics (eg, penicillins, trimethoprim/sulphonamides, doxycycline, metronidazole, rifampicin, clindamycin)
- Antifungals (eg, itraconazole)
- Non-steroidal anti-inflammatory drugs (eg, meloxicam)
- Opioids (eg, methadone, morphine)
- Diuretics (eg, furosemide)
- Chemotherapeutics (eg, vincristine, cyclophosphamide)
- Gastroprotectants (eg, omeprazole)
- Cardiac glycosides (eg, digoxin)
- Other drugs (eg, fluoxetine, mycophenolate, carbimazole, methimazole, ciclosporin)

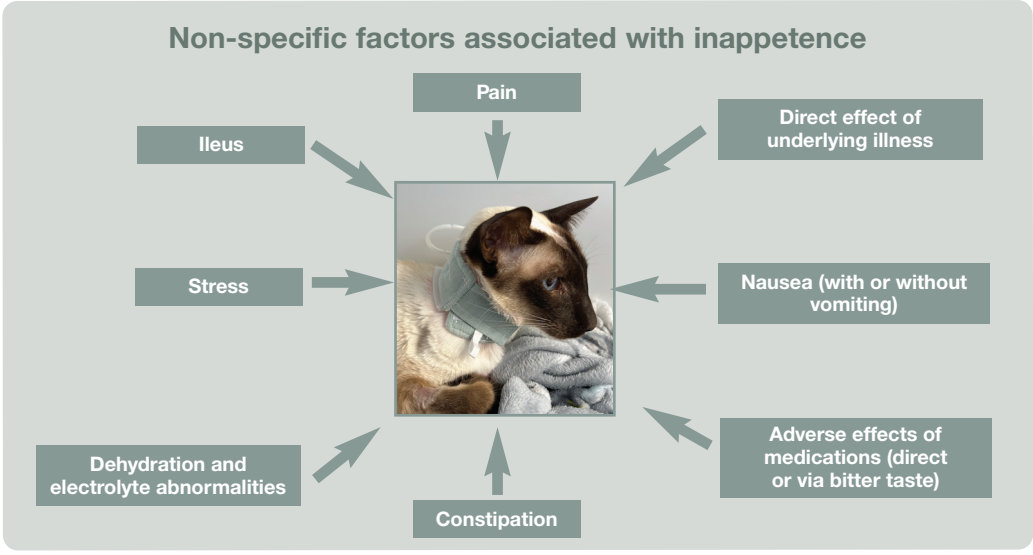
Medications may also cause inappetence due to a bitter taste (eg, metronidazole, gabapentin, fluoxetine) and/or stress associated with medication administration

Causes of inappetence in cats

There are numerous causes of inappetence in cats (see box). Certain cases of reduced food intake are functional, and have a more obvious cause, such as jaw fractures or other facial injuries; other conditions may lead to dysphagia, where the cat is interested in food yet unable to eat (eg, periodontal, oral or neurological disease). This may be termed 'pseudo-anorexia'.

In general, the most common causes of inappetence in hospitalised cats are conditions leading to nausea (with or without vomiting), pain or ileus, or the stress of hospitalisation itself (discussed in more detail later).[3,35] Certain conditions can affect appetite directly via inflammatory cytokines (eg, neoplasia).[36]

Figure 2 **Factors commonly associated with inappetence in hospitalised cats. All must be managed to encourage voluntary food intake. (See also Figure 6 for causes of distress in hospitalised cats.)** *Image courtesy of Sam Taylor*



Non-specific causes of inappetence

There are important non-specific factors commonly associated with inappetence in hospitalised cats that must not be overlooked, as summarised in Figure 2 and described below.

Nausea and vomiting

Many underlying conditions causing inappetence also lead to vomiting. When vomiting is

Figure 3 Signs of nausea may include ptyalism or more subtle signs (inappetence, lip licking and turning away from food). *Image courtesy of Serge Chalhoub*

not present, inappetence may sometimes be the only sign of nausea. Other signs include ptyalism (Figure 3), lip licking, turning away from food and retching at the sight/smell of food.[37] Management of the underlying disease is optimal, but an antiemetic treatment trial is also indicated; medication is selected based on the individual patient's condition, and may include maropitant, metoclopramide, mirtazapine and ondansetron (Table 2).[38]

Pain

Pain assessment and provision of adequate multimodal analgesia, selected and dosed to avoid adverse effects, will optimise voluntary food intake. Pain scoring systems, such as the Feline Grimace Scale,[60] UNESP-Botucatu multidimensional feline pain assessment scale short form[61] and Glasgow composite pain scale-feline,[62] should be used regularly to score pain in hospitalised cats and assess the response to analgesia.[63,64] An analgesic trial may be considered in inappetent patients, selecting agents based on the cat's clinical condition and any contraindications.

Gastrointestinal dysmotility

Gastrointestinal (GI) dysmotility may be a common sequela of critical illness and surgery in several species, including cats;[42,53] it is reported, in particular, in association with pancreatitis and hepatic lipidosis,[37] but is also associated with electrolyte abnormalities, medications such as opioids, primary GI disease and systemic disorders.[42] Ileus (decreased/lack of motility), with fluid and gaseous distension of the bowel, causes pain and inappetence, as well as fluid sequestration. Affected cats may show signs of nausea, abdominal distension, regurgitation, abdomi-

Table 2 Commonly used antiemetics, prokinetics and appetite stimulants for the management of inappetence in cats*

Drug	Dosage	Indications	Adverse effects
Maropitant[39–41]	1 mg/kg SC, IV or PO q24h	Prevention and treatment of nausea and vomiting	Pain on SC injection, lethargy, rare hypersensitivity reactions
Metoclopramide[42–45]	0.25–0.5 mg/kg IV, IM, SC or PO q8h 1–2 mg/kg IV over 24 h as a CRI	Prevention and treatment of nausea and vomiting Management of ileus and delayed gastric emptying	Excitation and disorientation
Ondansetron[44,46,47]	0.1–1 mg/kg IV (slowly), IM, SC or PO q6–12h (SC has higher bioavailability; use higher end of dosage orally)	Prevention and treatment of nausea and vomiting	GI effects, constipation, rare hypersensitivity reactions; increased liver enzymes reported in humans
Mirtazapine[48–52]	2 mg/cat PO or transdermal q24h (q48h with renal/hepatic disease)	Prevention and treatment of nausea and vomiting, appetite stimulant	Vocalisation, agitation; erythema at application site with transdermal use
Cisapride[36,42,45,53]	2.5 mg/cat PO q12h; dose titrated to effect and can be increased to q8h Dosages of up to 7.5 mg/cat q8h have been used in large domestic cats	Management of ileus and delayed gastric emptying	GI effects; cardiac arrhythmias reported in humans
Erythromycin[42,43,53]	0.5–1 mg/kg PO or IV q8h	Management of ileus and delayed gastric emptying	GI effects
Ranitidine[45,53,54]	2.5 mg/kg IV (slowly) q12h, or 3.5 mg/kg PO q12h	Management of delayed gastric emptying	IV boluses can cause vomiting and hypotension; oral suspension is bitter
Capromorelin[35,55–57]	2 mg/kg PO q24h	Appetite stimulant	Hyperglycaemia, vomiting, hypersalivation, lethargy, bradycardia, hypotension
Cyproheptadine[58,59]	1–4 mg/cat q12–24h	Appetite stimulant	Sedation; not recommended for use in cats with hepatic lipidosis

*Information contained in this table represents a consensus of opinion and experience of the guidelines panel members. Treatment is at the discretion of the attending veterinary surgeon. See text for further discussion of these agents
CRI = constant rate infusion; IV = intravenous; IM = intramuscular; SC = subcutaneous; PO = oral; GI = gastrointestinal

nal discomfort and diarrhoea, and are at risk of aspiration pneumonia. Additionally, ileus has a significant effect on the cat's nutritional status, reducing voluntary food intake and limiting the amount of food that can be given via a feeding tube, for example.[5,42]

Diagnosis of ileus is generally subjective, as evaluation of GI motility beyond ultrasound examination and radiography is unlikely to be available outside specialist practice. Contrast radiography is generally no longer used due to the risk of aspiration pneumonia, as well as stress and food aversion associated with administration of oral contrast media. Ultrasonography may reveal an inappropriate degree of gastric filling, reduced gastric contractions and reduced intestinal peristalsis. Normal rates of peristalsis are 4–5 contractions/min for the proximal duodenum and 1–3 contractions/min for the rest of the small intestine. A normal stomach should contract 4–5 times/min if it contains some food, and less frequently if empty.[42]

Management with pharmaceuticals to promote gastric emptying, such as metoclopramide, erythromycin or cisapride (Table 2), together with early enteral nutrition, is indicated, along with suction of fluid from the GI tract, if appropriate, and use of antiemetics and analgesics to promote comfort. Other types of GI dysmotility may result in inappetence in hospitalised cats, including gastro-oesophageal reflux, which is reported in critical patients[53] and during anaesthesia,[65] and may result in oesophagitis.

General considerations for management of inappetence in hospitalised cats

The risk of developing inappetence may be reduced by evaluating prescribed medications and how they are administered, and optimising treatments early on to promote appetite. Many commonly used medications may cause inappetence (see box on page 617); hence, reviewing prescriptions, discontinuing redundant and unnecessary drugs, switching from oral to IV or SC administration, if appropriate, and avoiding drug interactions may result in increased voluntary food intake. Bitter-tasting tablets can be put into gelatin capsules and bitter liquids should be avoided. Food offered to hospitalised cats should be palatable and good quality. However, feline food preferences are set at an early age, and may result in neophobia (dislike of anything new or novel; ie, preference for certain tastes and textures of food);[66] hence, presenting hospitalised cats with unfamiliar tastes and textures may result in inappetence and food aversion. This can commonly occur when a dietary history is not obtained, diets prescribed for the underlying condition are novel and unpalatable to the patient, or when hospitalised cats are force- or syringe-fed. Thus, such diets should not be introduced while the cat is hospitalised, and force-feeding is never indicated.

Prescription diets should generally not be introduced while the cat is hospitalised, and force-feeding is never indicated.

In addition to the management of nausea, pain and ileus, fluid deficits should be corrected along with electrolyte abnormalities. Dehydration may result in various negative clinical consequences, including inappetence. Hypokalaemia has been associated with reduced appetite[67] and ileus,[42] and is common in critically ill cats;[68] hence, serum potassium should be assessed and deficiencies corrected. Similarly, supplementation with cobalamin in vitamin B12-deficient cats may result in clinical benefits, including improved appetite.[69,70]

Constipation is common in hospitalised human patients, particularly older adults,[71] for reasons including dehydration, pain, electrolyte abnormalities, inactivity and immobility, and constipating drugs such as opioids. The same is likely true for feline patients, where risk factors including chronic kidney disease (CKD), obesity, older age, osteoarthritis and other comorbidities may contribute.[72] Additionally, cats may be reluctant to use litter boxes if they are used to defecating outdoors, or if the litter type/box is unfamiliar. If possible, caregivers should be asked to provide familiar litter, or soft sand litter should be used,[2] and other risk factors for constipation managed. Frequency of defecation should be documented in the hospital notes and laxatives administered if required.

Stress reduction should be considered with any cat in hospital, especially the inappetent cat. Strategies to reduce stress include noise reduction, gentle handling and provision of comfortable bedding, clean litter and somewhere to hide (see later).

In summary, when approaching the inappetent hospitalised cat, clinicians should consider each patient as an individual, and try to ameliorate all factors contributing to a lack of food intake.

Nutritional assessment of the hospitalised cat

Nutritional status should be measured as the fifth vital assessment (after temperature, pulse, respiration and pain assessment) and should be evaluated in every patient.[73] This is of particular importance in critically ill and hospitalised patients,[3,5] which are at high risk of inadequate food intake.[7] Such an assessment facilitates identification of cats with, or at risk of, malnutrition and those in need of nutritional support. Nutritional assessment will enable informed decision-making on choice of diet, the need for, and type of,

Nutritional assessment of hospitalised cats: factors to include

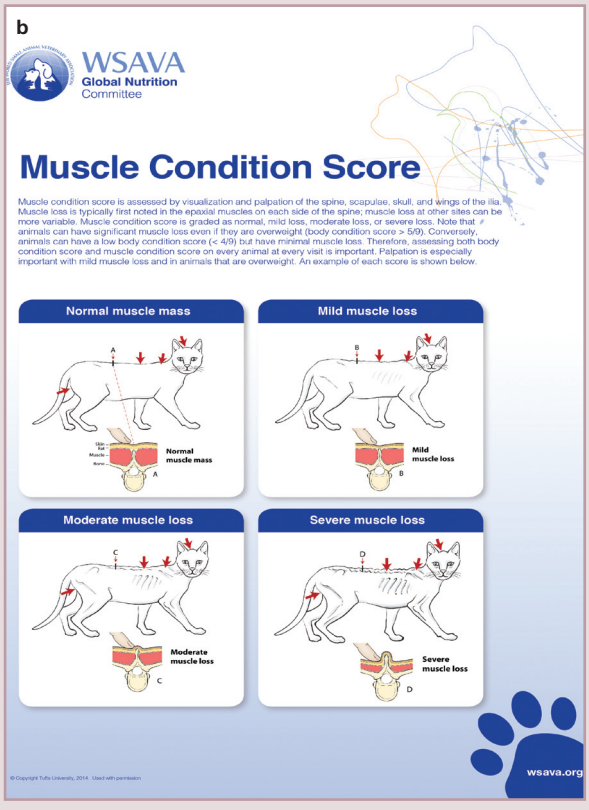


Figure 4 (a) Body condition score chart and (b) muscle condition score chart. *Images from the Global Nutrition Committee Toolkit provided courtesy of the World Small Animal Veterinary Association (WSAVA). Available at the WSAVA Global Nutrition Committee Nutritional Toolkit website: http://www.wsava.org/nutrition-toolkit. Accessed 20 October 2021.© WSAVA (image a) and Tufts University, 2014 (image b)*

- **Dietary history** from the caregiver (including preferences, current and previous diets) to allow determination of the adequacy of the diet as well as to provide vital information with regard to provision of food in the hospital ward, given the potential for cats to develop aversion to novel textures/tastes. An example dietary history questionnaire for caregivers is included in the supplementary material (see page 636).
- **Clinical history** (including recent appetite, presence of GI signs).
- **Physical examination** (eg, body condition, presence of effusions, haircoat quality).
- **Previous and current body weight**, to determine any loss/gain and the time over which it has occurred.
- **Body condition and muscle condition scores** (Figure 4).
- **Specific clinicopathological parameters** (eg, albumin, creatine kinase).

Assessment tool to identify the need for nutritional support

Parameter	Low risk	Moderate risk	High risk
Food intake <80% RER for <3 days	√		
Food intake <80% RER for 3–5 days		√	
Food intake <80% RER for >5 days			√
Presence of weight loss		√	
Severe vomiting/diarrhoea			√
Body condition score <4/9			√
Muscle condition score: moderate to severe muscle loss			√
Muscle condition score: mild muscle loss		√	
Hypoalbuminaemia		√	
Expected course of illness <2 days	√		
Expected course of illness 2–3 days		√	
Expected course of illness >3 days			√

A patient with two or more high-risk factors present should receive nutritional support immediately once stabilised. Patients with fewer than two risk factors should be closely monitored and reassessed daily.
RER = resting energy requirements
Modified from Perea (2012),[74] with permission of Wiley-Blackwell

assisted feeding required and which patients will benefit from early intervention. Evaluating a patient's nutritional status is challenging, but in practical terms will include assessment of the cat's weight, and body condition and muscle condition scores, as well as a full physical examination and recording of a dietary history. Additional factors that may be included to assess the risk of malnutrition include the presence of hypoalbuminaemia, severe vomiting and/or diarrhoea, and the predicted duration and severity of illness. Patients may then be designated as low, moderate or high risk (see box on page 620).[5]

On the basis of the nutritional assessment, cats with malnutrition can be promptly supported, and those at risk of malnutrition identified to allow early intervention, which can result in more positive outcomes.[5] Nutritional assessments should be repeated during hospitalisation, as the patient's clinical status, appetite and other factors alter over time and with treatment.[75] The feeding plan can then be adjusted accordingly.

Nutritional assessments should be repeated during hospitalisation, as the patient's clinical status, appetite and other factors alter over time and with treatment.

Nutritional support of the hospitalised cat: optimising the clinic environment to encourage voluntary food intake

Caring for cats appropriately means first understanding what a cat is, why it behaves the way it does and how that may impact efforts to meet its welfare needs in the clinic, including successfully providing nutrition.

Pet cats retain many of the characteristics of their wildcat ancestors, which are considered solitary survivalists. Cats are territorial, obligately carnivorous and, while they can be social with their own (and other) species, they are selectively so. Territoriality is a very important consideration in pet cats, as they are 'place bonded'.[76] Many cats do not cope well with change, having to share their territory with unknown cats, or other stressors.[77] Cats need free and immediate access to their resources, and a sense of autonomy is also integral to feline wellbeing. Communication may be subtle and different from that recognised in more socially obligate species, and is aimed at maintaining personal and resource safety in a non-contact/non-confrontational way.[78]

The predatory nature of cats, and how and where they acquire and consume food (see box), are important considerations in cat friendly feeding.

Feline senses

Cats' special senses are integral to feline behaviour, including their communication. Cats have highly attuned vision, hearing and olfaction, as well as tactile capability (particularly via their pads and vibrissae; Figure 5), all of which have developed to create proficiency in hunting and survival. Being in the clinic setting can overwhelm these special senses and cause distress, as the environment can be intense, unfamiliar and signal danger, with

Figure 5 Cats have highly attuned senses, including vision, hearing, olfaction and touch (pads and vibrissae), all of which should be considered when managing hospitalised patients. *Image courtesy of Sam Taylor*

Feeding behaviours: a vital part of being a cat

In unfamiliar settings, cats may be less flexible, sticking to familiar food.

- Much of the time and energy of free-living and wild cats is spent on feeding-related behaviours (active seeking out of hunting opportunities or patrolling favoured areas), and this remains part of the domestic cat's repertoire. Food consumption is frequent (up to 20 meals across 24 h), and usually takes place in the safety of the cat's core territory (which a hospital cage is not).[76,79]
- Many predatory forays (>50%) are not successful, with energy being expended on hunting. Also cats are crepuscular, being naturally more active and hunting around dawn and dusk.[80] These are important considerations, as it may not be possible, or the cat may not feel safe, to carry out normal play/predation behaviours in hospital.
- It is thought that cats prefer to drink fresh, clean water, which is separated from eating or toileting areas,[81,82] and this is potentially challenging to facilitate in a cage.
- Lifelong learning, including pre- and perinatal learning, is relevant in creating food preferences.[83] When in unfamiliar settings, cats may be less flexible, sticking to familiar food and avoiding novelty (such as 'recovery' or prescription diets).

Figure 6 The hospital environment contains multiple factors that can cause distress for cats. *Image courtesy of Sam Taylor*

no option to escape. Understanding these species-specific characteristics, as well as providing for individual cats' needs within the clinic setting, is vital to ensure mental wellbeing, which is inextricably linked to both physical health and appetite.

Stress and distress

Distress refers to an unpleasant emotional experience that is deleterious to mental wellbeing. Distress may encompass anxiety (anticipation of an aversive event), fear (including perceived threats), frustration (inability to attain something wanted or needed, or escape from something aversive), as well as the negative emotional component of physical pain.[78] Emotions are not mutually exclusive, and an anxious or fearful cat may also be feeling frustrated if, say, they cannot find a place of safety, or prevent physical contact in a handling situation. Frustration increases the vigour of behaviour (often leading to dangerous situations), as cats try to find ways to gain or avoid specific outcomes.

Engaging behaviours (seeking desired outcomes, such as social or tactile interaction) are often seen in positive emotional states, whereas negative emotions tend to correlate with protective behaviours (eg, aggression, hiding). Emotional arousal level is also important to monitor, as patients in states of high arousal may be less inclined to prioritise food intake. Emotional distress and physiological stress may occur in tandem, making it difficult to untangle clinical (physiological and behavioural) signs such as tachycardia or hyperglycaemia, and also significantly affecting mental wellbeing, food intake and therefore recovery from illness.[4,77,78,84] Figure 6 illustrates potential causes of distress and, in turn, reduced food intake in hospitalised cats.

A cat friendly ethos should be at the centre of care, aiming to avoid as many environmental and interaction stressors as possible.

Cat friendly strategies for feeding hospitalised patients

A cat friendly ethos should be at the centre of care, aiming to avoid as many environmental and interaction stressors as possible. Solutions are multifaceted – some examples of ways of preventing or alleviating distress in hospital are given in the box on pages 623 and 624.

In general, aim to address the underlying emotional state, where possible, through combined environmental management, human interactions and meeting of cats' needs.[4,78,82,85,88,89] At all times, good nursing and monitoring of a cat's emotional and physical health, as well as response to 'real-time interactions', is needed. Additionally, proactive feeding techniques, such as placement of feeding tubes (see later), may be required to improve the cat's physical condition and mental wellbeing and, in turn, encourage voluntary food intake. In many cases, the fewer interactions and handling events, the better.

Cat friendly feeding

Strategies to reduce stress and encourage voluntary food intake in hospitalised cats

The underlying cause of inappetence may relate to a cat's emotional state, in addition to illness, and therefore reducing distress is essential.[4,84] This should be achieved via cat friendly human–patient interactions, environment set-up and feeding, combined with judicious and timely use of anxiolytic medication, tailored to the cat's clinical condition.[85–87]

Human interactions

- Move quietly and slowly. Be predictable, calm and gentle. Talk quietly.
  - Do not approach directly or stare for prolonged periods of time.[85,86,88]
  - Avoid use of strong perfumes or scent on hands, clothing or body.[85,86]
- Use considerate, gentle restraint, working from easier to more sensitive body areas.[85,88]
  - Maintain continuous contact (depending on the individual cat's preference) to avoid startling the cat.
- Have the appropriate people and equipment ready for any procedure (eg, cat friendly nursing staff and tubes/syringes/needles) in advance of the cat being present, to avoid extraneous movement in and out of the room.[85,86]
- Do not persist in the face of an uncomfortable cat. Use a 'two-gentle-try/three-seconds-of-contact' rule for handling and interactions, then stop and reassess, if necessary.
- Never forcefully restrain a cat; avoid crushing or pinning, and never scruff.[85,88–90]
- Allow hiding, including during procedures. For example, offer the cat the opportunity to hide under a large thick towel, then gently extract/access and work with the relevant body part.[88,89]
- Remember to consider the potential for concurrent or pre-existing pain conditions, which may be negatively impactful for the cat generally, and more specifically during handling. Trial analgesia could be considered, if and when appropriate.[91]
- Recognise and respond to the cat's behaviour and body language, and observe for subtle signs of emotional comfort vs discomfort. This is far preferable to waiting for escalation (and then having to react).

Environment

- Aim to keep the hospital environment as calm, quiet and predictable as possible.[85,88]
- Avoid mixing of species, preferably with a cat-only ward. If not available, consider housing cats in collapsible cages in a consulting room, for example, or discharging dogs promptly.

Figure 7 **All hospitalised cats should have somewhere to hide, and also perch, within their cage. Even something as simple as a cardboard box will reduce stress and encourage voluntary food intake. (a) A Cat's Protection 'Cat Castle'; (b) a cat's own carrier used as a bed and perch in the hospital cage; (c) a simple cardboard box; (d) the front of the cage can be partially covered with a towel or blanket.** *Images courtesy of Sam Taylor (a and c), Nicki Reed (b) and Lumbry Park Veterinary Specialists, UK (d)*

Figure 8 **Cage layout can be optimised to reduce stress and encourage voluntary food intake, ideally by providing somewhere to hide and perch, and allowing food and water to be positioned away from litter trays and each other. Additionally, the front of the cage can be covered to offer more privacy.** *Image courtesy of Lumbry Park Veterinary Specialists, UK*

- Try to ensure cages face away from each other (avoiding visual contact between cats).
- Ensure every cat has somewhere to hide and perch in each cage. This could be a box or carrier, or as a minimum a towel hung halfway across the cage door (Figure 7).[85,86,92]
- Make cages seem warmer, and less reflective and noisy, by lining them with newspaper or incontinence pads; wrap elastic bands around metal door-post catches to reduce noise.[13,15]
- Try to use the three-dimensional space within the cage, and optimise the layout to reduce stress (Figure 8).[85,86]
- Use feline facial pheromones and ensure diffusers are plugged in 24 h a day, sited in a low-down, wide-open area. Check they are in date, and replace when needed.[93,94]
- Pre-spray bedding, towels, clothing and carriers with feline facial pheromones approximately 20 mins prior to the cat being present, and refresh every 4 h as needed.

Continued on page 624

Continued from page 623

✣ Spot clean cages, rather than replacing everything every time, to maintain a consistent scent profile and avoid disrupting all that the cat has habituated to in its cage.
✣ Consider including an item with the scent of the cat's home and/or caregiver.
– This can be placed in the cage and kept with the cat when moved around the clinic.[85,86]
✣ Try to allow some quiet time in the ward, with the lights off or dimmed low – especially at night. Do not switch the lights on directly from dark – use a dimmer switch or low-light torch to avoid startling the cats.

Feeding considerations

✣ Liaise with the caregiver over food preferences, routines and bowl material. See the supplementary material (page 636) for a dietary history questionnaire for the caregiver.
– Consider inviting the caregiver to come into the clinic to feed the cat. Depending on the patient's clinical condition, this can be carried out in a consulting room or other room outside of the main ward.
✣ Offer the cat opportunities to eat regularly. Provide small amounts of fresh food – ideally based on the cat's known preferences, or what the cat has been noted to show interest in. Be careful not to overwhelm with a selection of different foods, which can be aversive.
– Provide food so as the cat can both access and move away from it, and do not surround the cat with food bowls.
– Remove uneaten food within half an hour (unless the cat is known to eat at other times, such as at night, in which case ensure the food is not somewhere the cat cannot get away from).
– Separate resources, keeping food bowls away from litter trays and ideally away from water bowls and beds (Figure 8).
✣ Offer food at room or body temperature (avoid presenting it cold[95] or overheated, although some nauseous cats may benefit from the reduced scent of cooler food).
✣ Ideally, use food and water bowls that are flat or wide-brimmed, to avoid whiskers touching the sides, and ceramic to avoid metallic materials tainting food or creating reflections (Figure 9).

Figure 9 **Wide-brimmed ceramic bowls are preferred to avoid the cat's whiskers touching the sides of the bowl; this is particularly important for brachycephalic cats.** *Image courtesy of Linda Ryan*

✣ Avoid insisting the cat eats a prescribed diet while in hospital. Although this may be preferred clinically, voluntary ingestion is ideal, and prescription diets may not be especially appetising. Additionally, offering a diet in an aversive situation (when a cat is hospitalised and nauseous or painful) may mean that the diet is never accepted. Aim to transition the cat on to the recommended diet when recovered and at home.
✣ Avoid coercing, wiping food on the cat (in the hope they will lick it off) or syringe-/force-feeding. This will likely cause anxiety/fear/frustration and negative associations with food and feeding, and may escalate the cat's distress and lead to long-term food aversions.[96]
✣ Gauge from the caregiver whether the cat would prefer company when eating, or would be more likely to eat when the ward is quiet (eg, at night). Monitor the cat's response to interaction.
✣ Administer appetite stimulants and antiemetics, as appropriate (Table 2).
✣ If possible, use a soft fabric Elizabethan collar that allows the cat to eat, in preference to hard plastic collars, which may cause distress. Supervised periods without collars may encourage voluntary food intake and allow natural behaviours such as grooming.[97]

Positive experiences

✣ Create positive associations where possible (and avoid negative ones), so as to maintain a positive emotional state.
✣ Discover the cat's preferences and assess what they enjoy. This may include non-food reinforcement. With regard to tactile interactions and play, 'interview' the cat (remembering that acceptance does not equal enjoyment, especially in the hospital setting), and discuss this with the caregiver.
✣ Consider social or tactile reinforcement during medical interactions – depending on the cat's preferences.
– Consider feeding (eg, treats) during procedures and interactions (if the cat will eat), but factor in intake when calculating overall calorie intake, and take care not to reduce appetite for main meals.
✣ Offer a treat, quiet words or stroking (dependent on the cat's preferences) each time the cage is passed, so the cat learns that the cage is not only opened for procedures. Aim for a ratio of many more positive interactions (Figure 10) for every one occasion that handling is required for a procedure.
✣ Offer opportunities for enrichment in the cage – play, puzzle feeders and/or problem-solving toys – especially for patients hospitalised for more prolonged periods.

Figure 10 **Maximise positive experiences and interactions, if accepted by the cat. This cat particularly enjoyed being groomed and would often start to eat after being brushed in the cage.** *Image courtesy of Sam Taylor*

Nutritional support of the hospitalised cat: appetite stimulants

Appetite stimulants can be helpful in the hospitalised feline patient as a means of maintaining caloric intake. Indications and contraindications for use of appetite stimulants are outlined in the box (for dosing information, see Table 2). It is important to remember that these medications should not replace a diagnostic work-up for the underlying condition, and that conditions that can affect appetite (dehydration, anaemia, nausea, pain, fever, etc) should be addressed.

Currently there are two drugs that are approved for use in cats: mirtazapine (Mirataz; Dechra, USA, Canada and Europe) and capromorelin (Elura; Elanco, USA). Other putative appetite stimulants (steroids [anabolic or corticosteroids], megestrol acetate, propofol, diazepam, B vitamins) have not been assessed for efficacy or have significant side effects that likely outweigh their potential benefits.

Rational use of appetite stimulants

Indications
- Short-term use during diagnostic work-up
- Behavioural or environmental causes of inappetence
- Supportive care in acute and chronic disease
  - In cats 'thinking' about eating (eg, showing some interest in food)
  - In cats that are eating, but caloric intake is not sufficient (ie, RER is not reached)
- If placing a feeding tube is not an option

Contraindications
- Critically ill patients
- Active vomiting or nausea
- Physical impedance to prehension or ingestion
- Inadequate pain management
- Presence of ileus

Oral mirtazapine

Oral mirtazapine can be an effective appetite stimulant in cats, but higher dosages are more commonly associated with side effects (hyperexcitability, vocalisation, tremors) attributable to serotonin syndrome.[49,98] Thus, smaller, more frequent dosages (2 mg/cat q24h in the absence of contraindications) are recommended to maintain efficacy while minimising adverse effects. In young normal cats with no pre-existing liver or kidney disease, the half-life of oral mirtazapine is short enough that it can be administered daily.[98] Although more commonly used as an appetite stimulant, oral mirtazapine also demonstrates antiemetic properties, likely acting at the $5HT_3$ receptor similar to ondansetron.[99]

Mirtazapine is most commonly used in elderly and medically compromised patients, and medical status should be taken into account when prescribing. Due to renal elimination, cats with CKD have significantly longer clearance and higher drug exposure than age-matched controls;[100] thus, a 1.88 mg dose of oral mirtazapine is commonly given q48h in cats with kidney disease. The half-life of oral mirtazapine is also prolonged in cats with liver disease (alanine aminotransferase [ALT] >200 IU/l or total bilirubin >1 mg/dl).[50] Although there is correlation between mirtazapine half-life and alkaline phosphatase, ALT and total bilirubin concentrations, the alterations in metabolism appear variable and it is challenging to predict which cats would be the most affected. At this time there is no information that indicates that mirtazapine is contraindicated in hospitalised liver or kidney patients, merely that the dose and dosing interval should be carefully considered. When behavioural side effects are noted, a 50% dose decrease is recommended.

Transdermal mirtazapine

Transdermal mirtazapine achieves therapeutic serum concentrations, resulting in appetite stimulation, weight gain and improvement in body condition score in cats.[51,52,101,102] A clinical trial performed in 177 cats (83 mirtazapine, 94 placebo) with >5% unintended weight loss demonstrated that 2 mg applied daily to the inner ear pinnae for 14 days resulted in significant weight gain.[102] The most common adverse event was mild erythema at the application site (17.4% placebo, 10.4% mirtazapine). Cats with kidney disease experienced similar therapeutic efficacy without an increase in behavioural side effects (vocalisation, hyperexcitability). Therefore, for most CKD patients, daily dosing appears appropriate with this formulation of the drug.

For clinicians used to using transdermal mirtazapine, it should be noted that the appetite effect after administration may be more subtle in some patients than seen with oral mirtazapine. This is likely due to a flatter drug concentration curve and lower peak serum concentrations, a phenomenon that also results in fewer adverse effects with transdermal administration.[52,101] In hospitalised patients, perfusion status and body temperature should be taken into account when determining whether transdermal mirtazapine is appropriate, as poor peripheral perfusion may have an unknown effect on absorption.

Commonly, the hospitalised patient is sent home with appetite stimulant therapy to ease the transition to the home environment and promote caloric intake during the recovery period. Mirtazapine (oral or transdermal) is an effective appetite stimulant in cats with

CKD and results in significantly increased appetite and weight when administered at a dosage of 1.88 mg PO q48h for 3 weeks.[51,103] Long-term use is common in patients with chronic disease and anecdotally is not associated with negative repercussions.

Capromorelin

Capromorelin is a ghrelin receptor agonist, and thus acts directly as an orexigenic compound, stimulating appetite in a similar fashion as ghrelin, while also acting to stimulate growth hormone and insulin-like growth factor-1.[57] A clinical trial performed in 112 cats with CKD (71 capromorelin, 41 placebo) with >5% unintended weight loss demonstrated that 2 mg/kg PO q24h for 56 days resulted in significant weight gain.[104] The most common adverse events were vomiting, hypersalivation and lethargy.[55,104] Use in cats with acromegaly is contraindicated, and caution should be exercised in patients with diabetes as hyperglycaemia has been documented.[56,104] Transient bradycardia and hypotension have also been documented in feline patients. Therefore, it is recommend that this medication not be used in patients with significant systemic compromise, which likely precludes its use in hospitalised patients.[104]

Cyproheptadine

Cyproheptadine is not approved for use in cats, but historically has been commonly used as an appetite stimulant, with anecdotal efficacy (1–4 mg/cat q12–24h).[58] No studies have determined what dose alterations should be made in patients with kidney disease (cyproheptadine undergoes some renal elimination), and it is not recommended for use in cats with hepatic lipidosis due to anecdotal concerns for liver failure. The medication may take a few days to reach effective therapeutic levels and the primary adverse effect is sedation, which may preclude its use in hospitalised patients.[58] Cyproheptadine is the recommended antidote for mirtazapine toxicity; therefore, the two drugs should not be used concurrently.

In summary, appetite stimulants are a useful addition to the veterinarian's toolkit for the management of inappetent hospitalised cats, but must be used appropriately and only when nausea, pain and stress have been controlled. The effectiveness of appetite stimulants must be monitored closely in hospitalised patients to avoid underfeeding or a delay in implementation of more direct and reliable means of nutritional support such as feeding tubes.

Appetite stimulants must only be used in inappetent hospitalised cats when nausea, pain and stress have been controlled.

Nutritional support of the hospitalised cat: feeding tubes

Nutritional support can be provided enterally or parenterally – selection of route depends on patient nutritional assessment. Table 3 provides details, including advantages and disadvantages, of different types of feeding tubes.

Types of feeding tube

Feeding tubes are available commercially for the veterinary market, or human paediatric tubes may be used. Feeding tubes may be made of red rubber, polyvinyl chloride (PVC), polyurethrane or silicone elastomer. Polyurethrane is generally the preferred material as it is stronger than silicone, allowing the tube to have thinner walls and a wider internal diameter, with less chance of kinking. Silicone percutaneous endoscopic gastrostomy (PEG) tubes may deteriorate before polyurethane,[105] and PVC tubes can stiffen over time and cause irritation. Red rubber feeding tubes are flexible but can become brittle and split, requiring replacement; however, they can be more cost-effective.

Naso-oesophageal and nasogastric feeding tubes

Naso-oesophageal (NO) or nasogastric (NG) feeding tubes are suitable for short-term feeding (generally fewer than 5 days)[5,106] in the hospital setting (Figure 11) and when a cat is not a candidate for anaesthesia. They may also be used short term in sick cats to improve clinical condition and allow anaesthesia for longer term tube placement. However, their narrow diameter reduces diet choices to those liquid enough to pass down the tube without obstruction. In terms of selecting NO vs NG tubes, Yu et al (2013)[107] compared the two types of tube feeding in dogs and found no difference

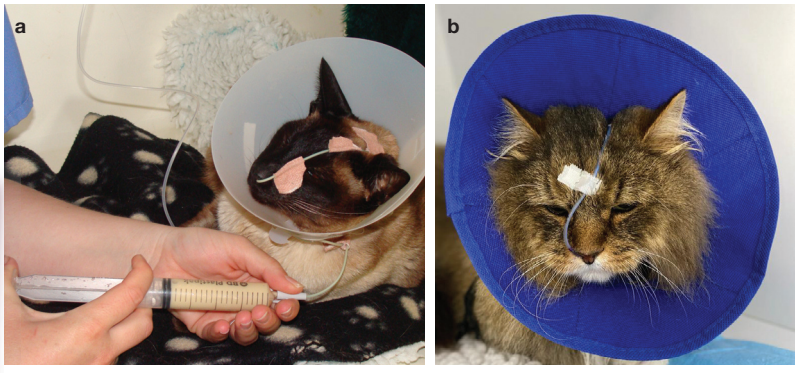


Figure 11 **Naso-oesophageal (NO) feeding tubes. (a) Cat with an NO feeding tube in place. Suitable for short-term feeding and easy to place, this tube is secured with tape and tissue glue. (b) This NO feeding tube is secured with sutures. Note the use of a softer fabric Elizabethan collar to prevent interference, while avoiding the stress associated with hard plastic collars and still allowing the cat to eat. Another method of securing NO tubes is the use of staples. With all methods, the aim should be to avoid patient distress/discomfort and interference with the whiskers or line of vision. Note that nasogastric tubes can be secured similarly.** *Images courtesy of Sam Taylor (a) and Lindsey Dodd (b)*

Table 3 Advantages and disadvantages of different types of feeding tubes in feline patients

Feeding tube	Duration of use	Advantages	Disadvantages	Contraindications	Comments
Naso-oesophageal (NO tube) or nasogastric (NG tube)	3–5 days	❖ Inexpensive ❖ Quick and easy to place ❖ No specialised equipment required ❖ Placed in conscious patients ❖ Can be used immediately and removed at any time ❖ Non-invasive	❖ Small bore tube, necessitating liquid diet ❖ Prone to obstruction ❖ Cannot generally be used to give non-liquid medications ❖ Prone to patient interference ❖ Can prevent voluntary food intake ❖ Requires use of a collar, which may cause stress ❖ Some cats may require sedation for placement ❖ Not suitable for home care	❖ Nasal disease ❖ Facial trauma ❖ Oesophageal disease ❖ Protracted vomiting ❖ Reduced mentation, poor gag reflex ❖ Coagulopathy	Often the tube of choice for critically ill patients as can be placed quickly with few contraindications and without anaesthesia
Oesophagostomy (O tube)	Long term (but can also be used short to medium term, as required)	❖ Inexpensive ❖ Easy to place with practice ❖ No specialised equipment required ❖ Increased choice of diets ❖ Medications can be crushed and given via the tube ❖ Well tolerated ❖ Can be placed in patients with head/nasal trauma or disease ❖ Can be used immediately and removed at any time ❖ Can be used by caregivers at home	❖ Requires general anaesthesia to place ❖ Can become obstructed ❖ Stoma site infection ❖ Requires a collar or dressing, which may cause stress	❖ Oesophageal disease ❖ Patients at high risk for general anaesthesia ❖ Coagulopathy ❖ Reduced mentation, poor gag reflex	Preferred for patients needing longer term nutritional support (eg, hepatic lipidosis, facial surgery, jaw fractures, pancreatitis)
Gastrostomy (placed surgically or percutaneously)	Long term	❖ Large bore tube, hence increased choice of diets ❖ Medications can be crushed and given via the tube ❖ Well tolerated ❖ Appropriate for long-term use ❖ Can be used by caregivers at home ❖ Allows placement of jejunal tubes	❖ Requires general anaesthesia to place ❖ Requires surgical or endoscopic equipment to place, and training ❖ Stoma site infection ❖ Risk of peritonitis ❖ Cannot be removed for 10–14 days ❖ Generally requires covering with a dressing, which may cause stress	❖ Patients at high risk for general anaesthesia ❖ Coagulopathy ❖ GI dysfunction (eg, ileus) or severe GI disease ❖ Severe hypoproteinaemia	Suitable for patients with oesophageal disease and those with long-term feeding requirements. A low-profile tube can be placed to reduce the need for dressings
Jejunostomy or nasojejunal	Variable (jejunostomy can be used long term; nasojejunal tends to be used for short-term feeding)	❖ Bypasses stomach and duodenum, which is advantageous in certain conditions (eg, severe gastric disease)	❖ Requires general anaesthesia to place ❖ Requires surgical placement and significant experience ❖ Stoma site infection ❖ Risk of peritonitis ❖ Small bore tube, necessitating liquid diet ❖ Not suitable for home care	❖ Patients at high risk for general anaesthesia ❖ Coagulopathy ❖ GI dysfunction (eg, ileus) or severe GI disease	Not used frequently but can be useful for selected patients with severe disease (eg, pancreatitis, gastric disease, gastroesophageal reflux, refractory vomiting)

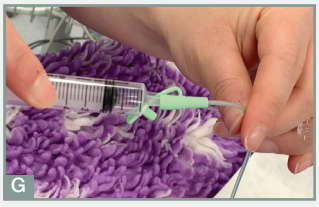
GI = gastrointestinal

in complication rate despite concerns regarding reflux of gastric secretions with NG tubes, and similar findings were reported in a recent study including cats.[108] Gastric reflux into the oesophagus is more likely a concern with larger bore feeding tubes.[109] Nasogastric feeding has been studied in 55 cats with pancreatitis, with minimal complications.[110] NG tubes have the advantage of the option to aspirate residual gastric content, which can be particularly useful in cats with ileus.[5]

With careful placement and use, complications of NO or NG tubes are likely to be minor. Obstruction and dislodgement are the most common complications, occurring in 8–13% of cats (see box on page 628).[110,111] Epiphora may

How to place a naso-oesophageal or nasogastric tube

- Prepare all equipment before you start, including an appropriate-sized tube (3.5–5 Fr), marker pen, tape, local anaesthetic (proxymetacaine) drops, tissue glue (or staples/sutures), an empty 2.5 or 5 ml syringe, a 5 ml syringe of sterile saline, and lubricant.
- NO and NG tubes can be placed in conscious patients using cat friendly handling techniques, and ensuring a quiet and calm environment out of sight of other cats or dogs. For some cats, sedation may be required, and tubes can also be placed under anaesthesia. Conscious cats should be positioned in sternal recumbency on a comfortable bed.
- Apply local anaesthetic drops to the nose and elevate the nose to allow liquid to flow caudally into the nasal cavity (image A). Always allow 1–2 mins for full effect.
- Measure the tube to the seventh intercostal space (NO tubes) or last rib (NG tubes), and mark with the pen or with tape (image B).
- Lubricate the tube and insert it into the nose, directing it ventrally and medially (towards the opposite ear) and into the ventral meatus (image C). The tube should pass without resistance, and the patient will swallow when the tube passes the oropharynx. If there is resistance, or the cat struggles or reacts strongly, apply further local anaesthetic, allowing time for it to take effect before trying again. If the cat becomes fearful, consider further sedation.
- Pass the tube to the level of the marker or tape.
- Secure the tube with tape and tissue glue (image D), staples (image E) or sutures (image F), ensuring the cat is comfortable and not distressed (if conscious) when the tube is secured. Avoid interference with the whiskers or positioning the tube in the cat's eyeline. For additional security, if required, the tube can also be taped to the cat's head.
- Check correct positioning of the tube after placement (and prior to all feeds – see below) by applying suction and achieving negative pressure (NO tubes) (image G), or by aspirating acidic gastric contents (NG tubes). Instilling air and listening for borborygmi, flushing with saline and monitoring for coughing (indicating incorrect placement), radiography, fluoroscopy or capnography (no carbon dioxide detected) are also used to assess tube position.
- Prior to each feed, check tube position, and flush the tube with at least 2 ml of water at body temperature (repeat after feeding) to prevent obstruction. Slowly feed liquid food (at body temperature), monitoring for signs of nausea, restlessness or coughing. Stop feeding if there are any concerns.



A video detailing the steps for NO/NG tube placement accompanies the guidelines (see Appendix 2, page 640; also available at bit.ly/inappetentcattoolkit).

Managing feeding tube obstruction

Tube obstruction is a common complication. Using diets that are sufficiently liquid in consistency or liquidised, and flushing the tube with water after feeding, can help prevent obstruction, along with leaving a column of water in the tube between feeds. Additionally, ensuring medications are adequately crushed and dissolved (eg, using a pestle and mortar) and choosing liquid formulations, if available, may reduce the risk.

In the event of obstruction, flushing and aspirating with warm water (body temperature) may dislodge the blockage. A solution of ¼ teaspoon pancreatic enzymes and 325 mg sodium bicarbonate in 5 ml water left in the tube for a few minutes before flushing again was effective in one study.[112] Anecdotally, carbonated drinks have been effective, but were less useful than water in the aforementioned study.[112] When flushing any solutions into the tube, account must be taken of the fluid volume and chemicals that will enter the cat's stomach/oesophagus.

Tube obstruction is a common complication.

be noted on the side where the tube has been placed. Vomiting and diarrhoea have been reported in cats fed via such tubes,[111] but may have many contributory factors. Irritation of the nose, self-limiting haemorrhage and sneezing may occur during placement. Gentle, cat friendly handling and light sedation (eg, gabapentin, butorphanol), if required, can reduce stress while placing the tube.

Inadvertent tracheal intubation with resultant pneumonia is a major complication of use of NO/NG tubes, but can be avoided by carefully checking tube position at placement and also before every use, as vomiting between feeds could dislodge the tube into the trachea.[109] Appropriate use of antiemetics (see Table 2) can help to reduce this complication. Placement of an NO or NG tube can be

Checking the correct position of a feeding tube

It is important to check the position of a feeding tube before *every* feed.

It is important to check the position of a feeding tube before every feed. Despite correct initial placement, the cat could vomit between feeds, resulting in tube dislodgement into the trachea and leading to aspiration pneumonia. A number of methods are described, as outlined below.

- Using a clean 5 ml syringe, aspirate from the tube to check for negative pressure (NO and oesophagostomy [O] tubes). For NG and gastrostomy tubes, a small volume of acidic gastric content may be aspirated, or food if gastric emptying is delayed.
- Inject 5 ml of air into the tube and auscultate the stomach for borborygmi (all tube types).
- Inject 2 ml of sterile saline into the tube and observe for signs of cough or respiratory noise suggesting endotracheal intubation (NO/NG and O tubes).
- Connect a capnograph to the feeding tube and check that this registers no carbon dioxide (all tube types).
- Aspirate fluid from the tube and test for acid pH (NG and gastrostomy tubes).
- Perform imaging upon placement and in the event of tube problems. Radiography can be used to check the position of all tubes, and also is the standard post-O tube placement (see Figure 13). It is not always required after NO/NG placement in conscious patients, as restraint could cause stress. Fluoroscopy and endoscopy can also be used to check placement. Ultrasound examination of the oesophagus and stomach has been used to confirm NO/NG tube placement in a recent study,[108] with 100% specificity but only around 20% sensitivity.

confirmed with thoracic radiography or fluoroscopy at the time of insertion, but given that these tubes tend to be placed in conscious cats, and the requirement for checking correct placement before every feed, the protocols outlined in the box above are recommended.

Cats should be offered food, under supervision, while the NO/NG feeding tube is in place. Removing Elizabethan collars, or using soft fabric versions, may help to encourage voluntary intake. If cats are still not eating adequately voluntarily when the NO or NG tube has been in place for 5 days, consideration should be given to placing a more medium-term tube such as an oesophagostomy (O) tube. Some cats may be deterred from eating by the presence of the tube; hence, tube removal and 'testing' of appetite may be needed, with the tube replaced if intake remains inadequate.

Nutritional interventions (eg, placement of feeding tubes) should be implemented no later than 3 days after cessation of eating.

Oesophagostomy feeding tubes

O tubes are a useful and well tolerated way to provide enteral nutrition to cats (Figure 12). Placement requires general anaesthesia but, with training, can be rapid. Moreover, these larger bore tubes allow a greater variety of diets and slurries to be fed, and also facilitate water and medication administration. Consideration should be given to placement when the opportunity arises; for example, when cats with current or predicted reduced food intake are anaesthetised for imaging or surgery. O tubes may be used for an extended period of time and can be better tolerated than NO tubes in some patients owing to the lack of fixings on the cat's face; also they can be used by caregivers at home, with minimal training and care requirements. Elizabethan collars may not be needed, as patient interference can be prevented using dressings or purpose-made fabric collars. In the panel members' experience, if dressings are kept to a minimum, tension on anchoring sutures is avoided, and the cat is comfortable, interference tends to be minimal.

The most common complications are stoma site infection and tube dislodgement. Two studies of O tubes have shown stoma site infections in 17.8% and 12.1% of cats, respectively,[113,114] with Breheny et al (2019)[114] reporting that cats receiving glucocorticoids or oncolytic agents were more likely to develop an infection. Guidance for management of stoma site infections is given in the box on page 631.

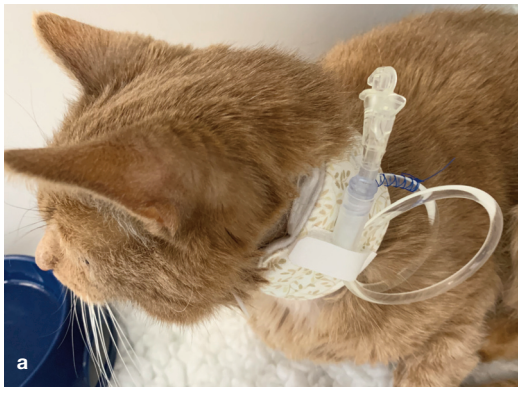
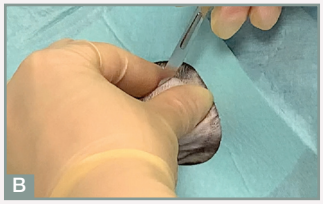
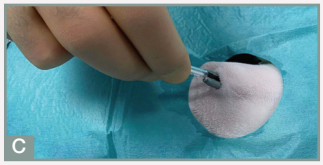


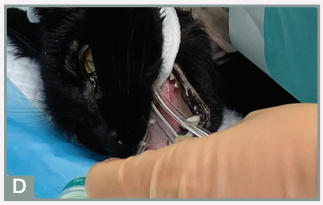
Figure 12 **Oesophagostomy (O) feeding tubes. (a) A polyurethane O tube coiled and kept in place with a purpose-made fabric collar (Kitty Collar). (b) An O tube with additional length removed (note this tube is secured with a finger trap suture to the periosteum of the wing of the atlas, as preferred by some clinicians). (c) A red rubber O tube covered with a dressing.** *Images courtesy of Sam Taylor (a), Danièlle Gunn-Moore (b) and Serge Chalhoub (c)*

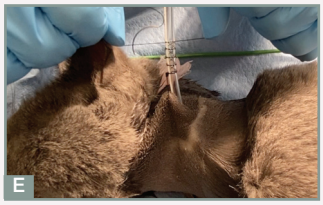
How to place an oesophagostomy tube

- Prepare all equipment before you start, including materials to clip and aseptically prepare the skin, a feeding tube (size 12–14 Fr), marker pen or tape, scalpel, scalpel handle, needle holders, forceps, curved forceps (eg, Carmalt), suture, an empty 2.5 or 5 ml syringe, sterile drape, sterile gloves and sterile swabs.
- Anaesthetise the cat with an endotracheal tube in place and position into right lateral recumbency.
- Measure the tube to the eighth intercostal space and mark with a pen or tape, or note the numerical marker.
- Clip the neck from the mandibular ramus to the thoracic inlet and extend to the dorsal and ventral midlines; prepare the area aseptically.
- Identify the correct site for tube placement (mid-cervical oesophagus [marked with an 'X' in image A], avoiding the jugular vein ventrally [arrow]).
- Insert curved forceps into the oesophagus via the cat's mouth and push the curved tips dorsally to tent the oesophagus towards the skin.
- Identify the tip of the instrument by palpation and make a small incision through the skin and oesophageal mucosa onto the tip of the forceps (image B).
- With the forceps protruding slightly through the skin incision (extending the incision marginally if needed), grasp the end of the feeding tube (image C), then close the forceps to secure the tube.
- Pull the feeding tube back into the oesophagus and out of the cat's mouth with the closed forceps. Hold onto the other end of the tube to avoid inadvertently pulling it into the oesophagus.
- Open the forceps to release the tube before curling it back into the cat's mouth and feeding it into the oropharynx, taking care to avoid the tube becoming tangled with the endotracheal tube and securing tapes (image D).
- Feed the tube into the oesophagus with the fingers while gently pulling the proximal end of the tube that is emerging from the incision; this will result in the tube straightening (felt as a subtle 'flip'), and facilitate its passage further into the oesophagus up to the marked level.
- Before securing the tube into position, again prepare the incision site aseptically and change gloves (if contaminated). Use a purse string and finger trap suture to secure the tube, avoiding over-tightening of skin sutures (image E). This may be carried out before or after confirming the tube is correctly positioned in the distal third of the oesophagus with radiography, fluoroscopy or endoscopy.
- Apply a light dressing or fabric collar to protect the stoma site (again, avoiding over-tightening).









A video detailing the steps for O tube placement accompanies the guidelines (see Appendix 2, page 640; also available at bit.ly/inappetentcattoolkit).

Tube migration or dislodgement in cats that are vomiting may occur and resuturing may be required. More serious complications of O tubes include damage to the vascular structures in the neck causing haemorrhage (thought to be a rare occurrence), and tracheal intubation. Other, minor complications include head swelling (often with excessively tight dressings), kinking of the tube and obstruction. A rare complication documented in the literature was Horner's syndrome and Pourfour du Petit syndrome following assumed injury to the vagosympathetic trunk associated with O tube placement in a cat.[115] Transient Horner's syndrome alone has been observed by one of the panel members (ST) and also recorded once in the literature.[116] Such complications are likely due to neuropraxia; generally there is spontaneous resolution without specific treatment.

After placement, O tube position is confirmed with thoracic radiography (Figure 13),

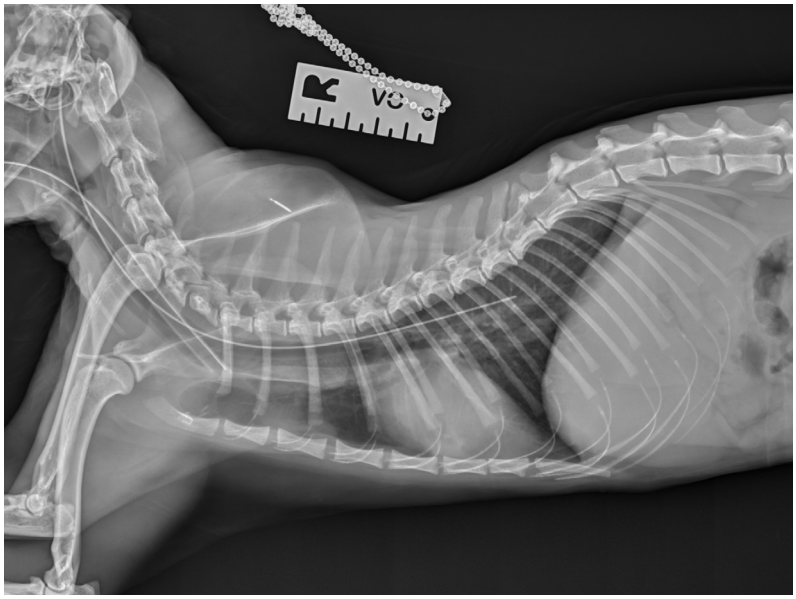


Figure 13 **Correct placement of an O tube confirmed with radiography. The tube should terminate in the distal third of the oesophagus.** *Image courtesy of Sam Taylor*

Managing feeding tube stoma site infections

Mild cases of stoma site infection may be managed with increased frequency of stoma site cleaning with an antiseptic solution and application of topical antibiotics.[5] Where there is more severe cellulitis or abscess development (Figure 14a,b), systemic antibiotics and tube removal may be indicated, with severe cases requiring surgical debridement. Samples should be taken for bacterial culture and sensitivity testing to ensure appropriate antibiotic use.

To prevent infection, feeding tubes should be placed in an aseptic fashion, using fresh instruments for suturing (rather than, for example, those used to pass or grab an O tube placed via the cat's mouth). Secure with sutures to avoid movement of the tube (ensuring suture tension is not excessive), cover with dressings and clean meticulously with antiseptic solution at least once a day. Iodine- or antibiotic-impregnated dressings or discs may be placed around the feeding tube site – extrapolating from a technique used in human medicine (Figure 14c).

Figure 14 Oesophagostomy tube site cellulitis (a) and abscess (b). Topical antibiotic therapy may be adequate to manage infection, along with increased cleaning of the site. However, infection may necessitate tube removal in some cases, as well as sedation or anaesthesia for surgical debridement/flush. Culture and sensitivity testing should be performed where possible to enable appropriate antibiotic selection. Antibiotic-impregnated discs (c) can be placed around the stoma site. *Images courtesy of Sam Taylor (a and c) and Carolyn O'Brien (b)*

fluoroscopy or endoscopy. A further check of tube placement is also made prior to every feed to confirm no inadvertent endotracheal intubation (see box on page 629).

Cats with O tubes in situ should be encouraged to eat voluntarily by offering food prior to a feed. Intake should be recorded, and the volume fed via the tube adjusted accordingly. Once voluntary intake has been satisfactory (75–100% of RER and adequate for maintenance or gain of weight) for at least 3–5 days, and/or the tube is no longer required, it can be removed by cutting the anchoring sutures, and gently pulling out the tube; sedation or anaesthesia is not required. O tubes can be removed at any time, as there is no need for a delay to allow a seal to form (unlike with gastrostomy tubes).[106] The stoma site should be cleaned and covered with a dressing for 24 h. It will heal by second intention (wound closure is not recommended).

Gastrostomy tubes

Gastrostomy tubes (Figure 15a) can be placed surgically or with endoscopic guidance (PEG tube). They can be used long term (in which case they can be replaced with a low-profile tube [Figure 15b]); their large bore makes them suitable for almost any diet, and they can be used by caregivers at home with minimal training.[117] Salinardi et al (2006)[118] examined complications of PEG and surgically placed gastrostomy tubes and found no difference in complication rates and severity scores between the two. Reported complications include injury to abdominal viscera during tube placement, peritonitis, cellulitis, stoma site infection, obstruction, vomiting and

Figure 15 Gastrostomy feeding tubes. (a) This cat was diagnosed with oesophagitis and was in poor body condition and benefited from placement of a gastrostomy feeding tube at the time of surgery for intestinal biopsy. Dressing of gastrostomy tubes can be challenging as dressings tend to 'bunch' cranially to the hindlimbs. Body suits may be tolerated by some cats, but care must be taken to avoid chronic stress associated with dressings/clothing while the tube is in place. (b) Cat with idiopathic megaoesophagus and a low-profile PEG tube. This cat was fed via the tube for 7 years. *Images courtesy of Sam Taylor (a) and Elise Robertson (b)*

Hospitalised cats may have intravenous or central venous catheters as well as feeding tubes in place. To avoid inadvertently feeding into an IV line, tubes should be appropriately labelled (Figure 16), and enteral feeding systems can be fitted with non-luer-tipped syringes and adapters.

Figure 16 When patients have both feeding tubes and IV lines, particularly central venous catheters, ensure they are appropriately labelled. *Image courtesy of Dan Chan*

metabolic derangements.[118,119] Additionally, pressure necrosis of the stomach wall and pyloric outflow obstruction can occur with overly tight or improperly located tubes, respectively.[119] It appears that treatment with corticosteroids might also increase the rate of complications for cats with a PEG tube. In a study by Aguiar et al (2016),[120] the rate of severe complications associated with PEG tubes (in a population of both dogs and cats) was higher in the corticosteroid-treated group.

Gastrostomy tubes cannot be removed for at least 10–14 days post-placement to allow a seal to form at the gastrostomy site.[119] Depending on the tube type, the mushroom tip may need to be removed endoscopically when the tube is cut, to prevent intestinal obstruction, although some types can be removed using gentle traction. As described above for O tubes, voluntary food intake should be adequate for 3–5 days prior to removal to ensure the tube is no longer required.

Jejunostomy and nasojejunal tubes

These types of tube are rarely placed in feline patients. Despite a suggestion that bypassing the stomach and pancreas may be beneficial in the management of pancreatitis, gastric outflow obstruction or gastroparesis,[121] research in humans with pancreatitis suggests that jejunal (or parenteral) feeding is not associated with a better outcome than NG tube feeding.[122] There has been little research in cats, but the same is likely to be true. Reported complications associated with jejunostomy tube use include cellulitis, tube dislodgement and migration, vomiting, dehiscence, peritonitis and tube obstruction.[123]

The primary purpose of nutritional support is to stabilise the patient's nutritional status rather than replenish lost body condition due to illness.

Parenteral nutrition

Parenteral nutrition (infusing nutrients intravenously) can be used as an alternative in patients unable to tolerate enteral feeding; for example, those with intractable vomiting and diarrhoea, lack of gag reflex, presenting a high anaesthetic risk or recovering from severe gastric or intestinal disease and coagulopathy. Parenteral nutrition may be associated with a higher rate of complications than tube feeding,[74] is more expensive and limited in availability. For these reasons – as well as on a physiological level (see page 633) – enteral feeding remains preferable in the majority of cases. However, safe administration of parenteral nutrition is possible and readers are referred to other sources for further details.[18]

Nutritional support of the hospitalised cat: creating a practical feeding plan

When to intervene

Given the metabolic and pathological changes that occur in cats following prolonged fasting,[31] nutritional interventions (eg, placement of feeding tubes or initiating parenteral nutrition if the enteral route is contraindicated) should be implemented no later than 3 days after the cessation of eating. When cats are presented for veterinary assessment of inappetence, it is important to take into consideration the number of days without normal food intake at home that have already elapsed, in addition to the number of days they have consumed less than the RER while hospitalised.

When to consider placing a feeding tube

The decision to place a feeding tube will depend on nutritional assessment of each individual case (see pages 619–621), plus other factors such as caregiver preferences and finances, and the cat's temperament. In general, indications for feeding tube placement include:

- Patients consuming less than 80% RER for 3 days or more, especially if associated with involuntary weight loss;
- When a cat is physically unable to consume an adequate amount of food voluntarily (eg, cats with disorders of the jaw, oral cavity, pharynx or oesophagus);
- When a patient is anticipated to not be able to consume adequate amounts of food (eg, following major surgery or while undergoing chemotherapy);
- When the patient is assessed as being at high risk of malnutrition or is overtly malnourished;
- To facilitate medication compliance, particularly when prolonged courses of multiple medications are required (eg, placement of an O tube for the treatment of mycobacteriosis).

Which type of diet?

Factors influencing choice of diet for the hospitalised inappetent patient

- The composition of diets fed to cats requiring nutritional support will depend on their primary disease and identification of nutrients of interest for the individual patient.
- If tube feeding is required, particularly with the use of NG or NO tubes, choices of suitable veterinary liquid diets narrow to convalescence/recovery and renal diets.
- Enteral liquid diets designed for humans are unsuitable for cats.
- Convalescence/recovery diets are typically formulated with increased amounts of high quality, highly digestible protein, and energy densities of around 1 kcal/ml, and are suitable for most cats requiring tube feeding.
- Patients that require moderation of protein (eg, advanced kidney failure, hepatic encephalopathy) or phosphate (eg, advanced kidney failure) can be fed liquid diets designed specifically for cats with kidney disease.
- Cats that require specific diets (eg, hydrolysed or limited antigen diets) may need larger bore (O or gastrostomy) tubes placed, as such diets are not always available in pure liquid form. Most foods can be blended/liquidised into slurries and will pass down the feeding tube.

Before the implementation of a feeding plan, cats should have been rehydrated, have had any major electrolyte and acid–base disturbances addressed and be cardiovascularly stable. Maintenance of normotension is desirable prior to enteral feeding in humans,[124] as enteric vasodilation could further reduce systemic blood pressure, and similar is likely the case in feline patients. See the box above for considerations influencing choice of diet.

RESOURCES FOR CAREGIVERS

Veterinary clinics can direct caregivers to the following resources for detailed information:

- Managing the cat that won't eat: information for owners/caregivers
- Managing the cat with a feeding tube: information for owners/caregivers (*plus accompanying video*)

See Appendices 1 and 2 on page 640; also available at bit.ly/inappetentcattoolkit.

Which route to use

Feeding into the GI tract will have the most benefit to the patient and so enteral nutrition should be pursued in most cases, unless there are apparent contraindications.[5] Enteral nutrition stimulates GI motility, enteric blood flow and local immunity, activates neuroendocrine pathways, promotes a favourable microbiota, reduces oxidative stress and imparts trophic effects on mucosal epithelium, thereby supporting enteric barrier function.[125] Even when patients can only tolerate a portion of the energy needs enterally, this route should be used as many of the benefits of enteral nutrition can still be realised.[126] Other factors to consider include the cat's medical condition, anticipated duration of support, and advantages and disadvantages of each tube (Table 3). In the event that cats show no tolerance to enteral feeding (eg, persistent vomiting despite antiemetic therapy), parenteral nutrition should be considered.

How much to feed

The primary purpose of nutritional support is to stabilise the patient's nutritional status rather than replenish lost body condition due to illness. Therefore, initial daily nutritional targets should be conservative. The aim should be to meet the RER within 3 days of initiating nutritional support, if tolerated by the patient (see box on page 634); for example, feed one-third RER on day 1 and, in the absence of adverse effects, increase to two-thirds on day 2.[5] In more debilitated patients or in the presence of significant morbidity (eg, severe GI dysfunction, major electrolyte and nutrient deficiencies, severe starvation), a more conservative approach may be necessary and meeting RER may take several additional days.[127] Following stabilisation of nutritional status (ie, stopping further weight loss) and when the cat is in recovery from the primary disease, energy targets can be increased to restore normal body condition.

In growing animals, once stabilised, energy targets will need to exceed RER – kittens may require 200% RER to support growth. Cats recovering from particularly catabolic conditions (eg, thermal burns, large exudative wounds) may also have energy targets that far exceed RER (ie, >200%).[128] However, as mentioned, overfeeding is associated with complications, so increases should be made slowly and only once the cat is stable.

Figure 17 Some patients with severe vomiting or regurgitation, for example, may benefit from being fed via a constant rate infusion, which can be facilitated with standard syringe drivers. *Image courtesy of Dan Chan*

Calculating RER for hospitalised patients

$$RER = 70 \times BW\ (kg)^{0.75}$$

Hospitalised cats should have RER calculated according to current body weight, even if over- or underweight. This avoids overfeeding, which can be associated with complications, such as refeeding syndrome (see page 636).[124] Weight should be recorded at least every 24 h and total calories fed adjusted by a maximum of 10% every 48–72 h according to weight gain or loss. The aim of feeding hospitalised ill cats is to provide nutrition and stabilise the patient. Body condition abnormalities can be corrected when the cat is in recovery phase.

The addition of 'illness factors' to RER calculations is no longer recommended.[5]

How to determine a feeding schedule

Generally, patients that are beginning to eat should have small but frequent meals, and this holds true for those being tube fed. Most animals being fed via feeding tubes can tolerate meals as boluses over 10–15 mins several times a day (eg, 3–6 meals per day). The decision regarding the frequency of feeding depends on patient factors (eg, tolerance to feeding volume, calories required) as well as practical considerations (eg, nursing care availability overnight, ability to use feeding pumps). Some patients may tolerate enteral feeding delivered as a constant rate infusion (CRI; Figure 17) better than bolus feeding (eg, less vomiting or regurgitation). There is currently no evidence supporting one modality over the other, so this needs to be determined on an individual basis.[129] Patients receiving a CRI should be positioned upright or with their head/neck supported, to avoid regurgitation.

Once feeding the full RER (as above, enteral nutrition should be introduced over several days), and provided there are no complications, the total maximum volume per bolus feed for a cat ranges between 5 and 15 ml/kg; if feeding via CRI, rates between 3 and 8 ml/h are generally well tolerated. Figure 18 illustrates a recording sheet for calculation of RER and feeding requirements, as well as for recording feeds, and is designed to complement general hospital records for cats receiving assisted nutrition.

What to monitor in patients with feeding tubes

Tips for cat friendly tube feeding are given in the box on page 635. Patients should not experience any distress (gagging, coughing, retching, vocalising, struggling) during tube feeding; if any distress is noted, feeding should stop immediately, and the feeding tube checked for dislodgement. For O and gastrostomy tubes, the stoma site should be assessed for signs of infection. Body weight, hydration status and vital signs should be checked daily; body condition should be

The decision regarding bolus feeding vs constant rate infusion needs to be made on an individual patient basis.

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Attach Case Label

Date:	Current weight (kg):	Admission weight (kg)	Body condition score (1–9):	Muscle condition score (0–3):
Calculation of resting energy requirement (RER): 70 x BW (kg)$^{0.75}$ (use current body weight)			=	kcal/day

Diet to be fed:		Caloric density of chosen diet:	kcal/ml
Water requirements (48 ml/kg/day) =	ml/day	Additional water added to feed? (Y/N)	Volume to add to each feed if required (ml) =

*Day 1	33% RER	(RER ÷ 3) ÷ caloric density of diet (kcal/ml)	Day 1 total daily volume: ml
*Day 2	66% RER	2 x (RER ÷ 3) ÷ caloric density of diet (kcal/ml)	Day 2 total daily volume: ml
*Day 3+	100% RER	(RER) ÷ caloric density of diet (kcal/ml)	Day 3 total daily volume: ml

Day of feeding	Mode (bolus/CRI)	Infusion rate (ml/h) if feeding by CRI	Number of feeds per day if feeding by bolus	Volume of food per meal for bolus (total daily volume ÷ number of feeds per day) (ml)

Time	Pre-feed flush volume (ml)	Feed volume (ml)	Additional water (ml)	Post-feed flush volume (ml)	Comments (eg, adverse reactions, positive interactions)	Initials

*For some cats, increasing to full RER over 3 days is too rapid. Monitor response and reduce percentage increase according to tolerance of feeding

Figure 18 Example feeding record for a hospitalised patient with a feeding tube. This record sheet is available to download from the supplementary material (see page 636)

Tips for comfortable and cat friendly tube feeding

- Hospitalised cats can be fed in the cage or moved to a quiet treatment area or consulting/examination room, depending on their perceived preference. Avoid any contact with dogs and other cats (sight, sound, smells).
- Allow the cat to relax before starting to feed. Provide a comfortable place to settle, allowing the cat to hide if they want to (eg, igloo bed, under a loose blanket), maintaining a sternal or upright position, or with the head slightly elevated (Figure 19).
- Use gentle support and avoid enforced restraint. If a cat resents handling, review analgesic, antiemetic and anxiolytic medications promptly, and delay the feed to allow effect.
- If absolutely necessary, the cat could be gently controlled using a soft, thick towel, or placed into a cat carrier or bed to restrict movement.
- Feed slowly, watching for signs of physical or emotional discomfort, nausea or pain (lip licking, excessive swallowing, backing away).
- Reassure the cat by speaking quietly and calmly. Stroking, if actively accepted by the cat, may be beneficial (desist if not).
- Do not rush the procedure; rapid feeding or rushed handling may cause negative associations with both feeding and handling.
- Food should be warmed to body temperature before administration, and mixed well to avoid 'hot spots'.
- Ensure appetite has returned consistently for 3–5 days before removing O and gastrostomy tubes. NO/NG tubes may need removal to fully assess appetite (their presence may deter the cat from eating in some cases); replace if voluntary intake is inadequate.

Rushing the procedure may cause negative associations with both feeding and handling.

Figure 19 Cats should be allowed to adopt a comfortable position when being tube fed, avoiding stress and heavy restraint. This cat is relaxed, accepting being stroked and shows no sign of nausea or pain while receiving an O tube feed. A bed has been placed under the cat's head to raise it slightly to avoid reflux of food proximally. *Image courtesy of Sam Taylor*

assessed for signs of infection. Body weight, hydration status and vital signs should be checked daily; body condition should be evaluated weekly. Patients should be monitored for signs of overhydration (eg, chemosis, gelatinous skin turgor, clear nasal discharge, increased respiratory rate, crackles on thoracic auscultation), since tube feeding and flushing of feeding tubes after each meal will likely mean daily fluid requirements are exceeded and can therefore lead to fluid overload in cats predisposed to this complication (eg, cardiac disease). This is a particular concern in patients concurrently receiving intravenous fluid therapy, which should be adjusted accordingly.

Hospitalised cats with feeding tubes that are able to eat orally should be offered food prior to feeding to encourage voluntary intake. Using soft fabric Elizabethan collars (as pictured in Figure 11b) or removing them and

Care of feeding tubes

Accurate recording of feeding tube checks and feeds in hospital records (Figure 18), standard operating procedures and staff training can minimise complications associated with feeding tubes and optimise patient recovery.

- Stoma sites should be uncovered, checked for evidence of infection or food leakage and cleaned at least once a day with an antiseptic solution (O tube or gastrostomy tube).[121] Cats with NO and NG tubes should be checked for inflammation of the nares or debris where the tube enters the nose.
- Prior to use on every occasion, checks should be performed to confirm appropriate tube placement (see box on page 629).
- Tubes should be flushed with warm water (at body temperature) before and after use, to prevent obstruction.
- Appropriate dressings should be placed, with consideration of the cat's tolerance and normal movement.
- If appropriate, cats should be offered small volumes of food prior to tube feeding to assess for return of appetite.

Tubes should be flushed with warm water before and after use, to prevent obstruction.

Refeeding syndrome

Occasionally, severely debilitated cats can develop a life-threatening metabolic condition termed 'refeeding syndrome' if fed in excess of what they can process.[127,130] Refeeding syndrome has been reported to occur even after short periods of starvation in human patients;[131] however, in a recent feline case series, affected cats had been missing (presumed starved) for more than 3 weeks.[127]

This syndrome is characterised by neurological signs (eg, depression, coma), systemic weakness, haemolytic anaemia, glycaemic dysregulation and severe electrolyte abnormalities (eg, hypokalaemia, hypophosphataemia, hypomagnesaemia) due to insulin-driven glucose uptake. Thiamine deficiency may also contribute to neurological signs.[127]

If refeeding syndrome is suspected, feeding should cease until the patient is stabilised and the feeding plan adjusted to avoid worsening of this syndrome. Identification of at-risk patients is important and includes cats that have been missing, had a complete lack of food intake, are severely debilitated with significant body condition loss (Figure 20) or those with electrolyte abnormalities prior to commencing feeding. Prevention of refeeding syndrome in such patients should include feeding no more than 20% RER on day 1 and slowly increasing the proportion of RER over 4–10 days depending on clinical response. Empirical supplementation of phosphate at 0.01–0.03 mmol/kg/h, potassium at 0.05 mEq/kg/h and magnesium at 0.01–0.02 mEq/kg/h for the first 24 h of therapy, provided the patient does not have electrolyte values above the reference interval, is recommended.[130] Thiamine can be administered prior to feeding (25 mg total dose, SC or IM) and repeated daily until signs resolve.[130]

Figure 20 **Severely debilitated cats and those that have been starved (typically after going missing) are at risk of refeeding syndrome. This cat had a body condition score of 1/5 after going missing for several weeks.** *Image courtesy of Sam Taylor*

SUMMARY POINTS

- The 2022 ISFM Consensus Guidelines on Management of the Inappetent Hospitalised Cat provide practical information regarding the frequently observed complication of suboptimal nutrition in hospitalised feline patients, with reach to those managed at home.
- Treatment of inappetence should consider the unique metabolism of the feline species and its susceptibility to stress and malnutrition.
- Prompt intervention, with feeding tubes if required, can optimise recovery of inappetent patients and expedite discharge from the hospital.

Supplementary material

The following files are available online at bit.ly/inappetentcattoolkit:

- Example dietary history questionnaire for caregivers.
- Example feeding record for a hospitalised patient with a feeding tube.
- Managing the cat that won't eat: information for owners/caregivers (see Appendix 1, page 640).
- Managing the cat with a feeding tube: information for owners/caregivers (see Appendix 1, page 640).
- Videos for veterinary staff with detailed instructions for placement of NO/NG and O tubes; video for caregivers on caring for cats with an oesophagostomy tube (see Appendix 2, page 640).

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Conflict of interest

Franck Peron is an employee of Royal Canin. Jessica Quimby is a consultant for a variety of companies including Dechra, Elanco, Boehringer Ingelheim, Vetoquinol, Zoetis, Purina, Hill's and Royal Canin. Sam Taylor has worked for various pet food and pharmaceutical companies on a consultancy basis. Cecilia Villaverde has done consulting work for a variety of pet food companies. She develops educational materials for Mark Morris Institute, sits on the scientific advisory board of FEDIAF and is a member of the Global Nutrition Committee of the WSAVA. She participates as a speaker in continuing education events sponsored or organised by pet food companies. The other members of the panel have no conflicts of interest to declare.

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Ethical approval

This work did not involve the use of animals and, therefore, ethical approval was not specifically required for publication in *JFMS*.

Informed consent

This work did not involve the use of animals (including cadavers) and, therefore, informed consent was not required. For any animals or people individually identifiable within this publication, informed consent (verbal or written) for their use in the publication was obtained from the people involved.

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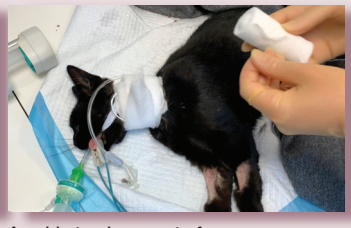
Appendix 1: Guides for caregivers

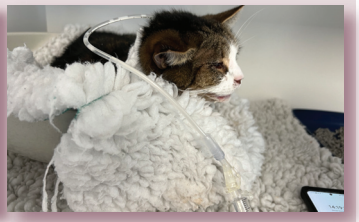
These guides for caregivers may be downloaded from icatcare.org/advice/cat-carer-guides, and are also available as supplementary material at bit.ly/inappetentcattoolkit

Appendix 2: Videos

A guide to placement of a naso-oesophageal or nasogastric tube in a cat
https://youtu.be/-WfuE8djYos



A guide to placement of an oesophagostomy tube in a cat
https://youtu.be/MiNvX2pF6to



A guide to caring for a cat with an oesophagostomy tube
https://youtu.be/UsLcTZ8u8Gk

Two videos on feeding tube placement and management, and a video to support clients caring for cats with a feeding tube, can be downloaded from the above links, and are also available as supplementary material at bit.ly/inappetentcattoolkit