



Commissioned paper*

Increased vocalisation in elderly cats

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SUMMARY

- With evermore cats living to become elderly, age-associated behavioural changes are being seen with increasing frequency.
- The behavioural changes reported most commonly are increased vocalisation (especially at night), and inappropriate elimination.
- The most common causes of increased vocalisation are cognitive dysfunction syndrome, hyperthyroidism (with or without systemic hypertension), systemic hypertension (most commonly associated with chronic kidney disease, hyperthyroidism or hyperaldosteronism), deafness, osteoarthritis (or other causes of chronic pain) and brain tumours.
- Approximately 30% of pet cats aged 11-14 years develop at least one age-associated behavioural problem; this increases to over 50% for cats aged ≥ 15 years.
- The diseases most frequently associated with increased vocalisation occur most commonly in elderly cats, and elderly cats often suffer from a number of concurrent interacting conditions.
- Owners often think increased vocalisation is a normal (if distressing) aging change so they fail to mention it to their veterinarian, hence manageable conditions are neglected and the cat's quality of life is poorer than it needs to.

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Introduction

The life expectancy of pet cats is increasing, such that >10% are now over 12 years of age ^[35]. Unfortunately, accompanying this growing population of elderly cats, are many cats with age-associated behavioural changes (Figure 1; Box 1). Two unpublished studies from the UK, each looking at >1000 elderly cats, found that increased vocalisation occurred in 54-66% of cats, with 30-37% of them vocalising most at night (V. Hall, unpublished data

Figure 1: Behavioural changes seen commonly in elderly cats.

- Inappropriate vocalisation, especially at night
- Spatial disorientation, e.g. forgetting where their litter box is (inappropriate elimination is the most common reason for the referral of elderly cats to behavioural specialists)
- Altered interaction with the family (people or other pets) e.g. attention-seeking behaviour
- Altered sleep/wake patterns
- Altered behavioural responses e.g. increased anxiety, or decreased response to stimuli
- Altered activity e.g. aimless wandering, or reduced activity
- Altered interest in food e.g. increased or, more typically, decreased
- Altered grooming, e.g. decreased or stereotypical
- Temporal disorientation e.g. forgetting that they have just been fed

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Box 1: Behavioural changes seen commonly in elderly cats (questionnaire studies of cats of ≥ 12 years of age (median 15 years) as observed in two studies from the UK, 15 years apart)^a:

1995; 1134 owners		2010; 1016 owners	
Increased affection to owner	81%	Increased affection to owner	30%
More vocal ^b	66%	More vocal ^b	54%
More vocal at night ^b	30%	More vocal at night ^b	37%
Less tolerant of other animals in the house	26%	Less tolerant of other animals in the house	21%
More tolerant of other animals in the house	24%	More tolerant of other animals in the house	12%

^a V. Halls, unpublished data, 2002; author unpublished data, 2012.

^b "Cries out loudly for no apparent reason and/or to try to gain my attention".

2002; author, unpublished data 2012, see Box 1). Interestingly, these studies both showed that with age, cats often become more affectionate towards their owners, and more demanding of their attention (30-81% of the cats); the increased vocalisation is often aimed at trying to gain their owners attention. However, at other times the cats appear to be vocalising excessively and frantically about something quite mundane e.g. being fed, or using the litter box. Sometimes they appear to be meowing for no apparent reason at all. Many owners report that this behaviour is, at times, quite frustrating. Unfortunately, having an elderly cat crying loudly at night can be particularly distressing as it results in broken sleep that can significantly damage the owner-cat bond and test family loyalties. While increased vocalisation (Figure 2) is not a disease in itself, it is a sign that an elderly cat is stressed and/or ill. It is important that we find out what is



Figure 2: The author's elderly cat vocalising to gain her attention.

Figure 3: Potential causes of increased vocalisation in elderly cats.

- Cognitive dysfunction syndrome (CDS e.g. resulting in senility, disorientation and confusion)
- Hyperthyroidism (with or without systemic hypertension e.g. resulting in irritability, disorientation, confusion and possible headache)
- Systemic hypertension (either primary, or secondary to hyperthyroidism, chronic kidney disease or possibly, hyperaldosteronism, diabetes mellitus, acromegaly, hyperadrenocorticism, or chronic anaemia e.g. resulting in irritability, disorientation, confusion and possible headache)
- Deafness (deaf cats, like deaf people, often vocalise loudly, probably because they cannot hear how loudly they are meowing)
- Osteoarthritis (OA e.g. resulting in pain on moving)
- Brain tumours (e.g. meningioma or lymphoma, resulting in headache, confusion, and seizures)
- Infectious disease causing neurological dysfunction (e.g. FIV, FeLV, toxoplasmosis, FIP, certain urinary tract infections)
- Chronic kidney disease (CKD e.g. uraemia encephalopathy)
- Acute blindness (often resulting from systemic hypertension e.g. resulting in confusion and disorientation)
- Liver disease (e.g. hepatic encephalopathy)
- Gastrointestinal disease (e.g. diarrhoea and intestinal spasm causing pain, or constipation causing pain leading up to and/or during defaecation)
- Other neurological diseases
- Other causes of pain (e.g. periodontal disease, ureteroliths, pancreatitis)
- True behavioural problems (e.g. separation anxiety)

wrong and treat them appropriately, so we can give them the best quality of life, for as long as possible. Excessive vocalisation (and other age-associated behavioural changes) can result from a number of

different disorders (Figure 3), including systemic illness (e.g. hyperthyroidism and/or systemic hypertension), organic brain disease (e.g. brain tumours, especially meningioma), true behavioural problems (e.g. separation anxiety) or, when everything else has been excluded, cognitive dysfunction syndrome (CDS). Determining the cause(s) involves a detailed investigation looking for physical (Figure 4) and/or behavioural problems.

Potential causes of increased vocalisation in elderly cats

Perhaps the most common causes of increased vocalisation in elderly cats are CDS, hyperthyroidism (with or without systemic hypertension), systemic hypertension (typically secondary to chronic kidney disease (CKD), hyperthyroidism or, possibly, hyperaldosteronism or diabetes mellitus (DM), deafness, osteoarthritis (OA, or other causes of chronic pain), and brain tumours (most commonly meningioma) (Figure 3). Since many of these conditions are discussed elsewhere in this journal, this paper will concentrate on the recognition and treatment of CDS, with only brief comments on the other conditions.

Cognitive dysfunction syndrome describes an age-related deterioration of cognitive abilities,

characterised by behavioural changes (Figure 1; Box 1), where no medical cause can be found^[10, 64, 39, 21]. A survey of older cats revealed that 28% of owners reported at least one age-related behavioural problem that appeared to relate to CDS in their cats aged 11-14 years, and this increased to over 50% in cats of ≥ 15 years: excessive vocalisation and aimless activity were the most common problems in these older cats^[47, 21]. Another study found that 36% of cats aged 7-11 years developed age-related behaviour problems, and this increased to 88% for cats of aged 16-19 years^[37].

The cause of CDS is still unknown, but compromised cerebral blood flow and chronic free radical damage because of poor antioxidant defences (e.g. lack of vitamins A, C and E) are believed to be important^[21]. Ultimately, chronic damage leads to disease similar to Alzheimer's disease in humans.

Hyperthyroidism is a common treatable cause of increased vocalisation, which can occur as a direct effect of thyroxin on the brain (typically seen as agitation, restlessness and aggression), and/or be associated with systemic hypertension causing cerebral vascular compromise. Other factors may also be involved e.g. polyuria without adequate access to water can cause

Figure 4: Investigation of increased vocalisation in elderly cats

Investigation of increased vocalisation in elderly cats should include:

- Full history, including previous trauma (which may have lead to OA), potential exposure to toxins or drugs (recreational or prescription), and any recent changes to the cat's environment (e.g. family members, other pets, the house itself, diet, etc.). Asking specific questions about alternations in the cat's behaviour can help in determining just how significantly the cat has changed (Elderly Cat Cognitive Dysfunction and Mobility Survey – see box on following page)
- Full physical examination (including assessment of body weight, calculation of percentage weight change since last seen and in the last year, body condition score, body muscle score, and retinal examination)
- Assess systemic blood pressure (this is essential as systemic hypertension is common in elderly cats and often presents as increased vocalisation)
- Mobility assessment; neurological and orthopaedic examinations - these can be challenging to perform in elderly cats as they need time to relax in a consultation room and then move about on their own volition, preferably on a floor that gives them sufficient grip without catching their nails. Setting up an obstacle course in the consultation room can be useful at assessing vision, plus neuromuscular and orthopaedic fitness. Asking the owner to bring in videos of their cat walking, climbing up and down the stairs, and navigating obstacles at home can be very helpful.
- Assess routine haematology and serum biochemistry, including total thyroxin and cobalamin (B12) concentrations.
- Urine analysis (including urine protein to creatinine ratio and bacterial culture [even if the urine sediment appears non-reactive as many elderly cats can have apparently silent urinary tract infections that can actually be causing problems, and their weak immune systems can result in apyuric infections where there is failure of migration of neutrophils into the urine^[44])

Depending on the initial findings, further investigation may include:

- Serological testing for FeLV, FIV, Toxoplasmosis, FIP or other infectious diseases
- Thoracic, abdominal or skeletal radiography or CT, abdominal ultrasound examination, ECG, echocardiography, intestinal endoscopy / exploratory laparotomy and biopsy collection
- Head or spine CT or MRI

Elderly Cat Cognitive Dysfunction and Mobility Survey

Is your cat ...	Yes	Maybe	No
Crying out loudly for no apparent reason	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Crying out loudly to gain your attention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Crying out loudly at night	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increasingly wanting to interact with you	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More reluctant to interact with you	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Playing less with other pets or toys	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleeping more and/or is less active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appearing forgetful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appearing anxious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wandering aimlessly around the house or garden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spending less time grooming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spending more time grooming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More interested in food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less interested in food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urinating inappropriately in the house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Defecating inappropriately in the house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Crying when being lifted up	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less willing to jump up or down	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Only willing to jump up or down from lower heights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Showing signs of stiff limbs and/or spine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less agile than previously	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Showing signs of lameness or limping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having difficulty getting in or out of its cat flap	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having difficulty going up or down stairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

It is important to ask if there that been any changes to the cat's environment that may be causing anxiety or distress as this can result in significant changes in the cat's apparent cognitive function and/or its willingness to be mobile.

It can be difficult to differentiate between many of the behavioural changes caused by CDS and/or other behavioural/neurological diseases in old cats, and those caused by OA. In addition, it is not unusual for an individual cat to have multiple interacting conditions.

cerebral dehydration resulting in confusion and depression, and polyuria may also be associated with secondary urinary tract infections (see UTI). Poorly controlled hyperthyroidism can occasionally present with disorientation and signs of bilateral central vestibular disease (dilated pupils, lack of menace response, neck ventroflexion and, sometimes, vocalisation); this is thought to result from secondary thiamine deficiency (similar to thyrotoxicosis-associated Wernicke's encephalopathy in humans^[67]).

Systemic hypertension is a common cause of behavioural changes in elderly cats. It can result in increased vocalisation (especially night-crying), disorientation, altered consciousness, circling and even seizures. It is most commonly associated with CKD, and hyperthyroidism. Systemic hypertension has a reported prevalence of ~25% in cats with CKD

in general practice, increasing to 60-65% in referral practice^[75, 61], and between 10 and 90% in hyperthyroid cats^[33, 73]. Hypertension in cats can also be associated with hyperaldosteronism, hyperadrenocorticism, DM, acromegaly, chronic anaemia, and erythropoietin therapy plus, potentially, glucocorticoid administration, phaeochromocytoma, and obesity^[30]. Since many of these diseases occur mainly in elderly cats this explains why hypertension is most common in this age group. In addition, a study of apparently healthy cats of ≥9 years of age (median 13 years) found 13% to be hypertensive^[32].

Deafness can cause cats to meow more loudly^[69]. The lack of familiar noises at night may cause a deaf cat to vocalise loudly when it wakes up disorientated, and so tries to attract its owner's attention looking for reassurance.

Osteoarthritis occurs in 60-90% of cats over 12 years of age [23, 12, 20, 42, 5], with changes being found most frequently in elbows, hips, stifles, tarsus and shoulders [23, 12, 11, 42, 71]. However, it can be easy to overlook OA in cats because it develops slowly, is typically symmetrical and cats are good at hiding their pain. The signs of OA in cats typically include a hesitance to jump, a stilted gait, more resting or sleeping, inappropriate elimination, poor grooming, aggressive behaviour, and/or a reluctance to use the cat flap [12, 20, 11, 71]. Increased vocalisation may occur in response to pain when being picked up and/or when changing position after resting or sleeping.

Brain tumours occur most commonly in older cats (mean age 11 years), with 70% being primary tumours, e.g. meningioma (58%), lymphoma (14%), pituitary tumours (14%) and gliomas (7.5%) [77]. The most common clinical signs are altered consciousness, circling, and seizures; increased vocalization can occur as a result of disorientation and confusion [49, 77, 76].

Chronic kidney disease can result in increased vocalisation when associated systemic hypertension causes cerebral vascular compromise (as in CDS). It can also occur when polyuria without adequate access to water cause cerebral dehydration, when polydipsia/polyuria predisposes to a secondary UTI (see UTI), or when severe uraemia results in uraemic encephalopathy.

Diabetes mellitus can result in increased vocalisation for many of the same reasons as CKD. In addition, unstable diabetes may cause sensory neuropathies, resulting in irritability, sensitivity to touch, and/or muscle pain; irritability may result in increased vocalisation.

Infectious disease e.g. FIV, FeLV, FIP and, particularly, toxoplasmosis, can all cause increased vocalisation associated with other behavioural changes when disease recrudesces in elderly cats undergoing immune senescence.

Urinary tract infections (UTIs) most commonly cause increased vocalisation as a result of bladder and/or kidney pain, typically associated with dysuria, periuria, pollakiuria, hiding, aggression, and/or pain on being lifted. *E. coli* UTIs can sometimes present with confusion and disorientation, similar to that seen in elderly humans with quinolone-resistant *E. coli* UTIs, where the bacteria

produce systemic toxins [13].

In elderly cats, UTIs are usually associated with CKD, hyperthyroidism or DM, where less concentrated urine is associated with local and/or systemic immunosuppression: 12% of cats with DM or hyperthyroidism have a UTI at some point in their illness, compared with 22-35% with CKD [18, 44].

Separation anxiety can occur in cats that are very bonded to their owner, when that person is absent. It affects indoor-only cats most frequently, and cats that are less than five years of age. However, it can still be seen in elderly cats, especially females. The most commonly clinical signs are inappropriate urination (70%), inappropriate defecation (35%), excessive vocalization (12%), destructiveness (9%), and psychogenic grooming (6%) [65].

Diagnosis of elderly cats with increased vocalisation

Veterinarians must ask about increased vocalisation in elderly cat consultations as owners rarely volunteer this information. This can be for a number of reasons: some owners do not realise that vocalisation is a sign of ill-health, some think it is just a sign of ageing, others feel that nothing can be done to help so there is no point in mentioning it, while others are embarrassed as they are not coping with the broken sleep that night-crying can cause. Veterinarians need to educate owners to realise that increased vocalisation is a sign of ill health or stress, and that ignoring it is to ignore a potentially treatable/manageable condition, and so leave the cat in a poorer quality of life that it deserves.

Determining why a cat has started to vocalise excessively involves a thorough investigation (Figure 4). Unfortunately, the diagnosis and management of disease in elderly cats is often complicated by concurrent interacting disorders. For example, hyperthyroidism and DM can cause very similar clinical signs, including increased vocalisation, and each can affect the diagnosis of the other; DM may suppress the serum thyroxin concentration to within the reference range [19, 15], while the increased protein turnover associated with hyperthyroidism can reduce the serum fructosamine concentration to much lower than would be expected with untreated DM [27, 60].



Figure 5: The author's elderly cat with marked elbow OA seen as elbow thickening and outward bowing of the front legs.

Much information can be gained from a careful, gentle and thorough physical examination. Pay particular attention to indicators of diseases that are associated with increased vocalisation, notably the rate and strength of the heartbeat, and the size of the kidneys and thyroid glands. Ophthalmic examination is mandatory, looking for signs of systemic hypertension (e.g. intraocular haemorrhage and/or hypertensive retinopathy), and/or signs of infectious disease (e.g. toxoplasma retinopathy), intracranial neoplasia (e.g. papilloedema – which can be subtle in cats), or malnutrition (e.g. taurine retinopathy). Let the cat walk around the consultation room: this can give insight to its vision, and enable some assessment of its nervous and musculoskeletal systems. Performing a careful orthopaedic examination, and watching a cat walk, are often all that is needed to diagnose OA. For example, feeling thickened elbows and seeing the cat walk with obviously bowed front legs is typical of elbow OA (Figure 5). While it is not necessary to confirm this with radiographs, it is always sensible to look for signs of OA when taking radiographs for other reasons.

Systemic blood pressure (BP) should be evaluated in all elderly cats. The Doppler method is currently considered the most appropriate indirect method for assessing BP. Unfortunately, oscillometric methods tend to underestimate the BP and fail in a significant number of conscious cats, and the Doppler method does not always allow the diastolic BP to be measured [3, 9, 31].

Further investigations should be tailored to the individual; starting with haematology and serum biochemistry, including thyroxin and cobalamin (B12) concentrations. The latter is recommended as many elderly cats may be hypcobalaminaemic because of pancreatic and/or intestinal disease [58], lack of intake (chronic hyporexia), hyper-metabolism associated with hyperthyroidism [14], and/or increased loss associated with CKD or other causes of polydipsia/polyuria [54]. Hypcobalaminaemia (in both cats and humans) can result in anorexia, anaemia, weakness, and neurological signs, including confusion and disorientation [70, 24, 78].

Urine should undergo routine analysis, protein to creatinine ratio, and bacterial culture. Since UTIs do not always result in clinical signs referable to the urinary tract, it is essential that elderly cats have regular urine cultures – if left untreated a UTI can cause deterioration of renal function, renal and/or bladder pain, urinary urgency and, in some cases, dementia and confusion. Pyuria and an active urine sediment are not always present with CKD, hyperthyroidism or DM [44], so the presence of a UTI can only be confirmed with bacterial culture. To reduce the need for repeated cystocentesis, primary screening can be performed on urine collected by the owner using a clean litter box with non-absorbent litter; even when collected like this a pure heavy growth of bacteria is highly suggestive of a UTI [17].

As indicated by the cat's history and clinical signs, serological and/or molecular testing may be undertaken to investigate the possibility of infectious disease(s).

Initially, most cats will only need to attend a clinic once or twice a year. However, those cats showing significant disease and/or more significant ageing changes will need to attend more frequently for repeated reassessment, monitoring and treatment.

Management of elderly cats with increased vocalisation

Successful management depends of making a full diagnosis of all potential causes of the cat's vocalisation (plus its other clinical signs), then addressing these disorders in a sensible stepwise manner. It is important to remember that elderly cats typically have a number of concurrent and interacting disorders, so the treatment of

one disease may affect another, sometimes improving it (e.g. treatment of hyperthyroidism can reduce concurrent hypertension), sometimes worsening it (e.g. treatment of hyperthyroidism can unmask CKD [19]).

While we may be able to offer complex therapeutic options (environmental, nutritional, medical and/or surgical), it is important to remember that older cats are often poorly tolerant of the stress of change, handling, medicating and/or hospitalisation. It is essential that each cat is assessed and treated as an individual, and the veterinarian needs to consider each cat's ability to cope with intervention(s) before undertaking them. Some investigations and interventions may have to be adapted or even abandoned if the cat is poorly tolerant of them for either medical or temperamental reasons. In addition, it is important that euthanasia be discussed at an early stage so that the cat's quality of life is always precedent: with chronic disease, it can be difficult for owners to decide when it is the best time to let their cat go, so having some form of record of the cat's time partitioning to different activities can help to bring objective data to this painful decision making process.

This EJCAP issue contains wonderful articles discussing DM, CKD, OA, hypertension and GI disease in elderly cats. There are also many reviews available for the treatment of hypertension [73], hyperthyroidism [66, 16, 55], DM [7, 55, 72], CKD [4, 34, 56], OA [43, 6], UTI [50], and brain neoplasia [77, 68, 48], and for the nutrition of aging cats [36].

Management of cats with CDS can involve environmental changes, dietary modifications and supplements, nutraceuticals, and/or drugs [22]. Unfortunately, there are few feline studies, and advice is largely extrapolated from dogs with CDS.

Environmental management, dietary modifications and supplements

Environmental factors can be positive or negative. Environmental enrichment can give mental stimulation, increase activity, and improve cognitive function, especially when combined with dietary modification [45, 46]. Lack of environmental stimulation can exacerbate CDS, as can negative factors that cause frustration, e.g. inconsistent feeding times add stress and can lead to intense vocalisation. Older cats often have concurrent diseases, which can lead to further frustrations, e.g. giving a high-sided litter box to a cat with CDS and

OA can lead to more vocalisation around the time of elimination. Environmental application of synthetic feline appeasement pheromone (Feliway®; Ceva) may help to alleviate anxiety and so reduce vocalisation.

There are a number of studies in dogs that show that nutraceuticals (enriched with antioxidants and essential fatty acids to reduce oxidative damage; alpha-lipoic acid and L-carnitine to enhance mitochondrial function; and omega-3 fatty acids promote cell membrane health) can significantly reduce signs of CDS in elderly dogs [8, 29, 63, 25, 51, 1, 59, 52, 2], as can enhanced diets, although they take longer to have an effect [29, 45].

In contrast, there is only one, rather poor, study looking at giving a nutraceutical (S-adenosyl-L-methionine; SAME) to cats with CDS [2], and very few studies looking at changing their diet (Hill's data 2008 [53]). Unfortunately, alpha-lipoic acid is toxic in cats [26] so products containing it should not be given. There is now a growing list of compounds suggested to be beneficial for cats with CDS, either as single ingredients or in potentially synergistic combinations [41]; however, placebo-controlled studies are needed to see which are truly effective.

Unfortunately, once a cat develops significant CDS, instigating change can have a negative effect as the stress of change (whether in environment, routine, diet, or family members) can exacerbate the signs of CDS [28]. Change should therefore be kept to a minimum, and when it must be made, introduce it gradually (where possible) and give the cat plenty of reassurance. Cats with severe CDS may feel less stressed if they are confined to a single room which contains all their essential needs (food, water, litter box, resting places, somewhere to hide, and companionship [if it makes then less anxious]); this core territory should then be kept constant [22].

Potential drug therapies

While there are a number of drugs to treat CDS in dogs, there are no drugs licensed to treat CDS in cats. However, selegiline (Selgian®; Ceva: Anipryl®; Zoetis: suggested dose 0.25-1.0 mg/kg PO q24h), propentofylline (Vivitonin®; MSD Animal Health: suggested dose 12.5 mg/cat PO q24h) and nicergoline (Fitergol®; Merial: when available, suggested dose 0.25 to 0.5 mg/kg) have all been used 'off label' in cats with varying success [40, 39, 74, 41]. A small open trial using selegiline showed a positive effect [38] and the American Association of Feline

Practitioners support its use for the treatment of CDS. Other drugs have been used to treat particular signs of CDS in cats, including anxiolytic drugs/nutraceuticals (e.g. Zylkène®; MSD Animal Health), buspirone and benzodiazepines (e.g. diazepam – care – hepatotoxicity), or antidepressants (that lack anticholinergic effects) such as fluoxetine.

Useful resources:

Cornell Feline Health Center: The Special Needs of the Senior Cat:

http://www.vet.cornell.edu/FHC/health_information/brochure_seniorcat.cfm

Pet Advisor: Why Does My Older Cat Yowl All the Time? (I'm Trying to Sleep!):

<http://www.petsadviser.com/pethealth/my-old-cat-meows-all-the-time/>

AAPCA Pet Care: Behavior Problems in Older Cats:

<https://www.aspc.org/pet-care/virtual-pet-behaviorist/cat-behavior/behavior-problems-older-cats>

Healthy Pets: Cognitive Dysfunction: Does Your Cat Prowl the House at Night and Vocalize? This May Be Why:

<http://healthypets.mercola.com/sites/healthypets/archive/2014/03/12/cat-cognitive-dysfunction.aspx>

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