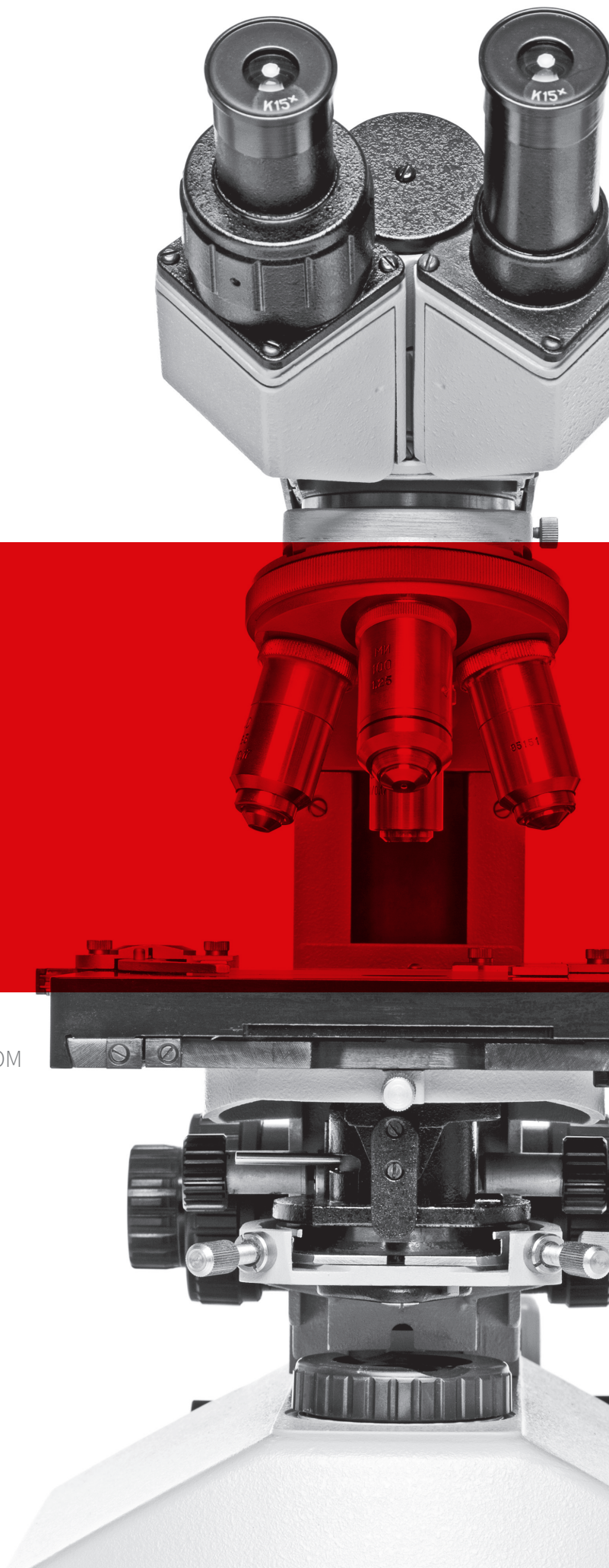


2022 RESEARCH REVIEW

A PRACTICAL GUIDE TO SCIENTIFIC ADVANCES FROM
clinician's brief®



FOREWORD

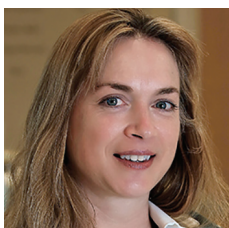
When we began publishing *Clinician's Brief* 20 years ago, our team aimed to provide the most up-to-date, relevant information. Our goal then was as it is today—to ensure our readers have the resources needed to make the most critical decisions in veterinary practice.

When they first appeared in the pages of *Clinician's Brief*, **Capsules**, an original content type, were snippets from the research literature intended to help practitioners stay on top of what was going on throughout the veterinary world. These snippets later morphed into **From Page to Patient**, which expanded the text to include practical pearls written by boarded specialists.

Today, our team recognizes the ever-increasing demands on general practitioners, seemingly with even less time to stretch between caseloads and continuing education. To reflect the need for succinct, digestible information, these resources will soon be upgraded to **2-Minute Takeaways**, with our team's pledge to provide need-it-now tips in as little time as possible. **2-Minute Takeaways** will include the same carefully curated summaries of respected peer-reviewed literature with practical tips written by experts in the field.

Until the debut of this new content type in early 2023, we encourage you to take a look at where the scientific body of knowledge has grown this year with this specially curated collection of **From Page to Patient** articles covering primary literature published in 2022. Included are topics spanning the realm of veterinary medicine—from analgesia to zoonoses.

We hope this collection helps you stay updated on medical advances while also looking ahead. Wherever your practice takes you, be sure to take us along; our purpose of providing information to inform your clinical decisions remains at the heart of everything we do.



Jennifer L. Schori
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Clinical Resources

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Optimal Propofol Infusion Rate in Dogs

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In the literature

Walters K, Lehnus K, Liu N-C, Bigby SE. Determining an optimum propofol infusion rate for induction of anaesthesia in healthy dogs: a randomized clinical trial. *Vet Anaesth Analg*. 2022;49(3):243-250. doi:10.1016/j.vaa.2021.07.006

FROM THE PAGE ...

Propofol (premedicated dogs, 1-4 mg/kg; nonpremedicated dogs, 6.5 mg/kg; IV over 10-40 seconds and titrated to effect) is commonly administered for smooth, rapid induction of general anesthesia.¹ Benefits include rapid onset, short duration of action, quick redistribution, and short elimination half-life.² Adverse effects are dose dependent, with postinduction apnea and hypotension being most common.^{3,4} Slow administration rate may decrease incidence of apnea.



This randomized, blinded clinical trial sought to determine the optimal propofol infusion rate for rapid tracheal intubation and reduction of postinduction apnea in healthy dogs. Dogs were randomly assigned into 5 groups. All dogs were premedicated with methadone (0.5 mg/kg IM) and dexmedetomidine (5 µg/kg IM). Thirty minutes after premedication, dogs were preoxygenated via facemask for 5 minutes. Each group was administered a different propofol infusion rate (0.5, 1, 2, 3, or 4 mg/kg/minute IV) for induction via syringe pump; infusions were discontinued once a dog was ready for intubation. After intubation, dogs were monitored until spontaneous breathing occurred. Time to intubation and duration of apnea were recorded. Cardiopulmonary variables (eg, heart and respiratory rates, oxygen saturation, blood pressure) were measured.

Propofol infusion rate had significant effects on both time to intubation and duration of apnea. Of the 60 dogs that completed the study, those that received propofol at 0.5 mg/kg/minute or 1 mg/kg/minute had a significantly shorter duration of apnea. None of the 60 dogs desaturated during the study. Between these 2 groups, intubation time was shorter in dogs that received propofol at 1 mg/kg/minute. Effect on blood pressure was not significantly different among groups.

Based on results of this study, the optimal rate of propofol infusion for induction of general anesthesia is 1 mg/kg/minute. Slow titration is recommended so propofol concentrations can equilibrate between the blood and the brain to achieve loss of consciousness with minimal adverse effects. Faster infusion rates lead to higher plasma concentration that exceeds the minimum dose to achieve unconsciousness, increasing the likelihood of apnea and hypotension.

This study only evaluated healthy dogs premedicated with methadone and dexmedetomidine. The cardiovascular effect of dexmedetomidine-induced vasoconstriction may have helped minimize the hypotensive effect of propofol. The effect of a priming bolus to help reduce total propofol induction dose was not evaluated.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Propofol should be administered slowly IV and titrated to effect during induction; premedicated dogs require a lower dose.
- 2** Slow administration allows for a time delay between drug administration and loss of consciousness, as propofol concentrations need to equilibrate between the blood and brain.
- 3** Rapid administration can cause post-induction apnea, which can result in desaturation if patients are not preoxygenated prior to induction.

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3. Muir WW III, Gadawski JE. Respiratory depression and apnea induced by propofol in dogs. *Am J Vet Res*. 1998;59(2):157-161.
4. Cattai A, Rabozzi R, Ferasin H, Isola M, Franci P. Haemodynamic changes during propofol induction in dogs: new findings and approach of monitoring. *BMC Vet Res*. 2018;14(1):282. doi:10.1186/s12917-018-1608-8

Based on results of this study, the optimal rate of propofol infusion for induction of general anesthesia is 1 mg/kg/minute.

Grapiprant or Carprofen for Postovariohysterectomy Analgesia in Cats?

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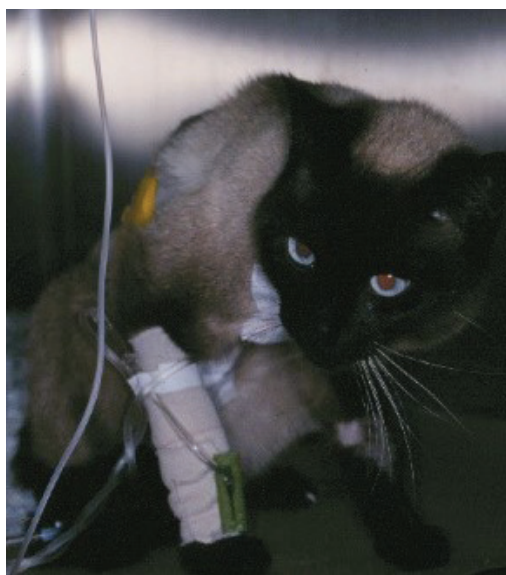
In the literature

Teixeira LG, Vaccarin CV, Schimites PI, et al. Grapiprant or carprofen following ovariohysterectomy in the cat: analgesic efficacy, hematological, biochemical and urinalysis evaluation. *J Feline Med Surg*. 2022;24(8):e153-e162. doi:10.1177/1098612X221097935

FROM THE PAGE ...

Preoperative oral analgesics can help manage intra- and postoperative analgesic requirements. Carprofen (an NSAID that preferentially inhibits the COX-2 enzyme and thus prostaglandin E2 synthesis) and grapiprant (a specific antagonist of the prostaglandin E2 receptor EP4) can be administered orally but are considered extra-label in cats.¹ Both drugs are FDA-approved for use in dogs.

This study compared effects of carprofen (4 mg/kg PO once) and grapiprant (2 mg/kg PO once or every 12 hours) when initially administered 90 minutes prior to ovariohysterectomy in cats. Analgesic effects were assessed at baseline and at 1-, 3-, 6-, 8-, 12-, and 24-hours postoperatively using validated and moderately validated pain scoring systems with set intervention levels for rescue analgesia (morphine, 0.1 mg/kg IV).¹⁻³ Hematologic, biochemical, and urinalysis variables and urine protein:creatinine ratio were also evaluated.



▲ **FIGURE** Cat displaying signs (eg, rigid sitting position with back arched, head down, muzzle and whiskers pulled ventrally, anxious appearance) included in validated pain scoring systems.^{2,3} Photo courtesy of Lesley Smith, DVM, DACVAA

Pain scores did not significantly differ among treatment groups (ie, carprofen once, grapiprant once, grapiprant every 12 hours), and scores at 3 hours after surgery were higher than scores at 24 hours in all groups. Significantly more cats required rescue analgesia in both grapiprant groups (14 out of 21 cats [67%]) compared with the carprofen group (2 out of 11 cats [18%]). Glucose increased from baseline at 1 hour in both grapiprant groups. No other variables differed among the groups. Leukocytosis, presumably associated with inflammation, was noted 12 hours postoperatively in all groups. Grapiprant administered every 12 hours did not result in observed benefits.

These results suggest oral grapiprant administration prior to ovariohysterectomy did not provide adequate postoperative analgesia at 3 hours in cats. Preliminary investigations in dogs indicated grapiprant may be comparable with carprofen for analgesia following ovariohysterectomy, but sample sizes were limited, and further studies are necessary.⁴

Although results suggest carprofen may be preferable to grapiprant for acute postoperative pain in cats, 2 out of 11 cats in the carprofen group required rescue analgesia, indicating carprofen alone may also be inadequate postoperatively in cats, including after ovariohysterectomy. Multimodal pain management is thus highly recommended; pre-emptive or preventive analgesia, continuous and overlapping pharmacologic and nonpharmacologic therapies (including agents with different mechanisms of action), and matching the analgesic plan to the degree of injury or surgery should be considered.¹

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Grapiprant (2 mg/kg PO) administered 90 minutes prior to ovariohysterectomy did not provide adequate analgesia in most cats 3 hours postoperatively and was associated with acute increases in systemic glucose for up to 1 hour.
- 2** Neither oral grapiprant nor carprofen altered important hematologic variables (eg, platelet numbers, indirect markers of acute kidney or liver dysfunction).
- 3** Grapiprant alone should not be used for post-ovariohysterectomy analgesia in cats but may be useful as part of a pre-emptive, multimodal analgesic plan for surgery, especially if additional chronic pain is expected.

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These results suggest oral grapiprant administration prior to ovariohysterectomy did not provide adequate postoperative analgesia at 3 hours in cats.

Pain Scoring in Dogs with Anxiety

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In the literature

Ellwood B, Murison PJ. Investigating the effect of anxiety on pain scores in dogs. *Vet Anaesth Analg*. 2022;49(1):135-142. doi:10.1016/j.vaa.2021.07.005

FROM THE PAGE ...

Pain assessment in dogs is important for optimal management but can be challenging. Pain scales can help identify and quantify pain based on changes in behavior or facial expressions; however, anxiety and other emotional states can interfere with scoring.

This study used Glasgow Composite Measure Pain Scale-Short Form (CMPS-SF), which is a behavior-based scale for acute pain in dogs, to investigate the relationship between anxiety and pain scores in 18 dogs undergoing surgery for stifle disease. Dogs were divided into groups based on preoperative anxiety levels evaluated by the reactivity evaluation form (REF), which is behavior based, and a visual analog scale (VAS). Fifty percent of dogs with the highest REF scores were designated high REF, and remaining dogs were designated low REF. Dogs were also designated high VAS (ie, 50% with highest VAS scores) or low VAS. Anesthetic and surgical protocols were chosen by the clinician for each case. All dogs were assessed for pain and anxiety preoperatively and 2 to 6 hours postoperatively by the same observer using CMPS-SF, REF, and VAS.

REF and VAS postoperative anxiety scores increased significantly compared with preoperative scores in the low REF and low VAS groups but not in the high REF and high VAS groups. CMPS-SF pre- and postoperative pain scores did not significantly differ between high REF and low REF groups or between high VAS and low VAS groups.

Anxiety increased after surgery, with significant increase in dogs that had lower baseline anxiety. There was no pre- or postoperative relationship between baseline anxiety levels and pain scores.

CMPS-SF assessment of acute pain in dogs does not appear to be affected by level of anxiety.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Hospitalization and medical procedures (eg, surgery) increase anxiety in dogs. Pharmacologic and nonpharmacologic approaches to avoid and reduce negative emotional states (eg, stress, fear, anxiety) should be considered to promote patient welfare.
- 2** Pain assessment is considered the fourth vital sign, and all patients should be assessed for pain, including pre- and postoperatively, depending on the procedure performed and drugs administered.
- 3** Behavior-based or grimace scales with demonstrated scientific validity and reliability should be used for standardized pain evaluation, as they can help monitor pain scores over time and evaluate response to analgesics; cutoff scores may provide clinical guidance for administration of rescue analgesia (when available).

Suggested Reading

- Evangelista MC, Watanabe R, Leung VSY, et al. Facial expressions of pain in cats: the development and validation of a Feline Grimace Scale. *Sci Rep*. 2016;9(1):19128. doi:10.1038/s41598-019-55693-8
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- Steagall PV, Monteiro BP. Acute pain in cats: recent advances in clinical assessment. *J Feline Med Surg*. 2019;21(1):25-34. doi:10.1177/1098612X18808103

Vertebral Left Atrial Size in Dogs with Preclinical Myxomatous Mitral Valve Disease

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In the literature

Lee D, Yun T, Koo Y, et al. Change of vertebral left atrial size in dogs with preclinical myxomatous mitral valve disease prior to the onset of congestive heart failure. *J Vet Cardiol.* 2022;42:23-33. doi:10.1016/j.jvc.2022.05.003

FROM THE PAGE ...

Vertebral left atrial size (VLAS) is a radiographic measurement that objectively estimates left atrial size and can help determine whether cardiac enlargement is present in dogs with suspected or diagnosed myxomatous mitral valve disease (MMVD). VLAS can be useful when other imaging modalities (eg, echocardiography, thoracic-focused point-of-care ultrasonography) cannot be performed (eg, due to financial constraints, lack of availability, lack of technical expertise). Increase in vertebral heart size (VHS) prior to onset of congestive heart failure (CHF) and rate of change in VHS over time (VHS/month) can help predict possible occurrence of CHF.¹⁻³ Additional studies in dogs with MMVD have reported VLAS ranges for each stage of disease.⁴⁻⁶

This retrospective study investigated whether VLAS can help determine if dogs with preclinical MMVD are at higher or lower risk for developing CHF. Dogs ($n = 41$) were assigned to 2 groups based on whether or not CHF developed within 180 days of initial diagnosis of MMVD. Radiographic and echocardiographic parameters, including VLAS and rate of change in VLAS over time (VLAS/month), at 3 time points (ie, first visit, 1-180 days postdiagnosis, 181-360 days postdiagnosis) were compared between groups. Results demonstrated no significant difference in VLAS between the groups at the first visit; however, VLAS and change in VLAS over time were significantly higher in the group that developed CHF within 180 days of initial diagnosis of MMVD.



... TO YOUR PATIENTS

Key pearls to put into practice:

1 Not all patients in the current retrospective study received pimobendan; results should thus be interpreted with caution. Pimobendan is administered to most dogs with stage B2 MMVD based on the ACVIM consensus statement and EPIC clinical trial results.^{7,8} A follow-up study of this cohort of dogs found that VHS consistently decreased during the first several months of treatment; this decrease was associated with a better outcome, longer preclinical time period, and reduced risk for developing CHF within 6 months.

2 Owners of dogs with MMVD should be instructed on home resting respiratory rate monitoring. Effective monitoring and accurate measurement of resting respiratory rate at home is an effective way to monitor patients between visits to the clinic. Small changes can be communicated to clinicians, allowing phone consultations and possible initiation of a furosemide trial to help avoid emergency clinic visits during an episode of CHF.

3 A cut-off VLAS value of >2.95 was specific for identifying dogs with impending (ie, within 180 days) CHF, but sensitivity was low, indicating that a large number of dogs with VLAS >2.95 will not develop CHF within 6 months; however, this measurement can help identify dogs at greater risk.

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Impact of Alternative Proteins on Feline Cardiomyopathy

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In the literature

Karp SI, Freeman LM, Rush JE, et al. Dilated cardiomyopathy in cats: survey of veterinary cardiologists and retrospective evaluation of a possible association with diet. *J Vet Cardiol.* 2022;39:22-34. doi:10.1016/j.jvc.2021.11.002

FROM THE PAGE ...

There is an association between echocardiographic parameters and median survival time in dogs with dilated cardiomyopathy (DCM) fed diets high in pulses (eg, peas, lentils)^{1,2}; a similar correlation may exist in cats.

This 2-part study examined possible associations among diet, taurine, and DCM in cats. A survey was distributed to board-certified veterinary cardiologists ($n = 52$) to evaluate for changes in frequency of DCM diagnosis in cats. Only 15% of cardiologists perceived an increase in cases over the previous 2 years; however, 92% of respondents reported seeing at least one cat with DCM each year, and 38% of respondents saw at least one cat with DCM suspected to be associated with diet in the previous 2 years. Plasma or whole blood taurine concentration was always or sometimes measured by 59% of respondents, and 80% of respondents reported they supplement taurine regardless of testing status.

Data of cats diagnosed with DCM in the previous 2 years (submitted by survey respondents) were then retrospectively evaluated. Records of 67 cats were reviewed; 37 met the inclusion criteria. Cats were divided into low pea/lentil (low PL; $n = 20$) and high pea/lentil (high PL; $n = 14$) diet groups based on diet at time of diagnosis; 3 cats were excluded due to lack of diet history. No significant difference in median survival time was identified; however, cats in the high PL group transitioned to a low PL diet after diagnosis had a significantly longer

median survival time (290 days) than high PL cats not transitioned (2 days). There was no difference in median survival time between cats fed a high PL diet with no diet change and those fed a low PL diet.

An association between taurine supplementation and change in median survival time was not found. Of 13 cats that had plasma and/or whole blood taurine measured, 2 had low circulating plasma taurine levels (both were fed a low PL diet).

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1 Diagnosis of DCM in cats is rare, but it is commonly believed that DCM has increased in frequency with increased feeding of diets high in pulses (eg, peas, lentils, beans, chickpeas).
- 2 Patients fed a high PL diet presented for congestive heart failure related to DCM appear to have significantly improved median survival time when transitioned to a low PL diet.
- 3 Association between poorer long-term outcomes in cats with DCM and high PL diets is independent of taurine status. Further evaluation is warranted to discern pathophysiologic mechanisms.

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2. Walker AL, DeFrancesco TC, Bonagura JD, et al. Association of diet with clinical outcomes in dogs with dilated cardiomyopathy and congestive heart failure. *J Vet Cardiol.* 2022;40:99-109. doi:10.1016/j.jvc.2021.02.001

Vitality of Discolored Teeth in Dogs

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In the literature

Feigin K, Bell C, Shope B, Henzel S, Snyder C. Analysis and assessment of pulp vitality of 102 intrinsically stained teeth in dogs. *J Vet Dent.* 2022; 39(1):21-33. doi:10.1177/08987564211060387

FROM THE PAGE ...

Intrinsically stained teeth are a common finding in dogs and exhibit discoloration within tooth hard tissues, unlike extrinsically stained teeth, which have discoloration on the tooth surface. Causes of intrinsic staining include amelogenesis imperfecta, dentinogenesis imperfecta, tetracycline ingestion during tooth development, dental fluorosis, tooth resorption, hyperbilirubinemia, pulp necrosis, injury, and aging.¹



Intrinsic staining can indicate pathology or injury that may affect tooth health or vitality. Determining appropriate treatment can be challenging, as many patients do not have radiologic or clinical signs that can definitively predict tooth vitality.

This prospective study analyzed clinical, radiographic, and histopathologic characteristics of 102 intrinsically stained teeth. There was no evidence of coronal injury (eg, fracture, displacement, mobility) in 55 (53.9%) out of 102 teeth. On histopathologic analysis, 85 (87.6%) of 97 intrinsically stained teeth were nonvital. Radiographic evidence of endodontic disease and periodontal disease was present, respectively, in 58 (57%) and 49 (48%) of 102 intrinsically stained teeth; 29 (28%) had evidence of tooth resorption. Only 19 (18.6%) of 102 intrinsically stained teeth were radiographically normal. All teeth with radiographic evidence of periapical lucency had pulp necrosis. Incisor teeth were most commonly affected, but all tooth types (ie, incisors, canines, premolars, molars) were discolored.

A previous study found that 92.2% of intrinsically discolored teeth were nonvital based on gross appearance of the pulp.² The current study is the first to histopathologically confirm pulp death, and results verify that a high percentage of intrinsically discolored teeth are nonvital; however, normal contralateral teeth were not histologically evaluated for comparison.

All teeth with radiographic evidence of periapical lucency had pulp necrosis.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Tooth discoloration is a common posttraumatic complication caused by pulpal hemorrhage. Hemolysis of RBCs follows pulpal hemorrhage, and more profound discoloration can occur when hemolyzed RBCs combine with putrefying pulpal tissue.³ Transillumination can help demonstrate increased opacity of an intrinsically stained tooth, but subtle changes can be difficult to detect with the naked eye.
- 2** Intrinsically stained teeth are likely nonvital. In this study, most (87.6%) intrinsically stained teeth were histopathologically confirmed to be nonvital, which is consistent with results of a previous study.²
- 3** Nonvital teeth are likely to develop endodontic and periodontal disease and should be treated quickly with exodontics or endodontics.
- 4** Radiographic signs may support a diagnosis of nonvitality but are not definitive.^{3,4} All teeth with radiographic evidence of periapical lucency also had pulp necrosis in this study.

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Marin PD, Bartonld PM, Heithersay GS. Tooth discoloration by blood: an in vitro histochemical study. *Endod Dent Traumatol*. 1997;13(3):132-138. doi:10.1111/j.1600-9657.1997.tb00026.x

Slurry Preparation: A Novel Cytology Technique for Skin Lesions in Dogs

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In the literature

Rich N, Brune J, Duclos D. A novel cytological technique for bacterial detection on canine skin. *Vet Dermatol.* 2022;33(2):108-e30. doi:10.1111/vde.13036

FROM THE PAGE ...

Impression smear and tape-strip preparations are traditional and validated skin cytology methods for diagnosis and monitoring of suspected bacterial or *Malassezia* spp overgrowth.

This study compared slurry preparation, a novel cytologic sampling method, with traditional methods to detect bacteria and *Malassezia* spp in 30 dogs presented with atopic dermatitis that had lesions consistent with superficial bacterial pyoderma and/or *Malassezia* spp dermatitis. Samples



were collected using impression smear, tape-strip, and slurry preparation methods and stained with modified Wright-Giemsa stains.

For slurry preparation, a microspatula with a flat-ended blade was used to scrape the surface of a lesion; debris (including scale and crust) was collected on a glass slide. One drop of sterile water was placed on the slide and gently mixed via rocking. The slide was then briefly heated on a hot plate, after which the slurry was mixed and larger debris macerated with a wooden applicator stick, yielding an opaque liquid. Larger, unmacerated debris was removed from the sample, and the preparation was again briefly heated to dry remaining water. This preparation method took 2 to 3 minutes.

Slurry preparation identified significantly higher numbers of bacteria compared with other techniques; however, tape-strip cytology detected more yeast than slurry preparation.

Slurry preparation is a reasonable alternative to impression smears and tape-strip preparation for crusted and scaly lesions to improve chances of identifying bacterial infection. The authors recommend sampling pustules with impression smears instead of the slurry method, as pustules need to be ruptured prior to sampling.

Slurry preparation is a reasonable alternative to impression smears and tape-strip preparation for crusted and scaly lesions to improve chances of identifying bacterial infection.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Skin cytology is recommended at both initial and follow-up examinations in patients presented for itching, scaling, crusts, or skin debris.^{1,2} A combination of sampling methods can be used, depending on lesion appearance. For example, tape-strip cytology may be used on inflamed and scaly feet, impression smears may be used for a pustule on the ventral abdomen, and slurry preparation may be used for crusting on the dorsum during a single examination of a dog.
- 2** It may be easier for less experienced examiners to review impression smears and slurry preparations for bacteria, *Malassezia* spp, and inflammatory cells; tape-strip cytology preparations can appear more crowded to the untrained eye.³
- 3** Skin cytology allows for judicious oral antimicrobial use, as patients may have scaling or crust caused by *Malassezia* spp infection alone.³ Routine use of skin cytology at follow-up examinations can also help guide timing of bacterial culture and enable correlation between culture results and morphologic characteristics of bacteria on cytology.¹

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2. Miller WH Jr, Griffin CE, Campbell KL. Bacterial skin diseases. In: Miller WH Jr, Griffin CE, Campbell KL. *Muller & Kirk's Small Animal Dermatology*. 7th ed. Elsevier; 2013:191.
3. Bond R, Morris DO, Guillot J, et al. Biology, diagnosis and treatment of *Malassezia* dermatitis in dogs and cats Clinical Consensus Guidelines of the World Association for Veterinary Dermatology. *Vet Dermatol*. 2020;31(1):28-74. doi:10.1111/vde.1280

Efficacy of Allergen-Specific Immunotherapy in Dogs with Atopic Dermatitis

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In the literature

Fennis EEM, van Damme CMM, Schlotter YM, et al. Efficacy of subcutaneous allergen immunotherapy in atopic dogs: a retrospective study of 664 cases. *Vet Dermatol.* 2022;33(4):321-e75. doi:10.1111/vde.13075

FROM THE PAGE ...

Canine atopic dermatitis requires lifelong management including monotherapy or multimodal treatment options, which can include allergen-specific immunotherapy (ASIT). ASIT is currently the only allergy therapy that can alter the course of atopic dermatitis.¹



This retrospective study evaluated the efficacy of ASIT in 664 dogs diagnosed with atopic dermatitis at 1 of 2 referral centers. No dogs had additional diagnosis of cutaneous adverse food reaction, and all dogs underwent intradermal allergy testing and/or allergen-specific immunoglobulin E serologic testing prior to ASIT. Allergens in the ASIT formula were selected based on individual patient testing and included mites and pollen. After an induction phase, dogs were given a subcutaneous maintenance dose every 3 to 4 weeks for at least 9 months.

Patient age at the start of ASIT ranged from 6 months to 12 years (mean, 4.08 years). Small-, medium-, and large-size breeds were included, with Labrador retrievers predominating (19.6%). Concurrent treatment with oclacitinib, cyclosporine, or systemic glucocorticoids was permitted.

Response to immunotherapy was based on owner-assessed pruritus, clinician impression, and concurrent use of systemic antipruritic medications and was scored as excellent (ie, atopic dermatitis controlled by ASIT monotherapy), good (ie, $\geq 50\%$ improvement in clinical signs and $\geq 50\%$ reduction of systemic antipruritic drug dosage [if applicable]), or poor (ie, unchanged pruritus or $< 50\%$ improvement in clinical signs and reduction of concurrent systemic medications). A good to excellent response was noted in 59.9% of atopic dogs after 9 months; this is within previously reported ranges (ie, 51%-64%).²⁻⁴

Repeat examination by a referral clinician at least once every 3 months was associated with a significantly better response to ASIT. Significantly poorer clinical responses were noted in dogs coadministered systemic glucocorticoids with ASIT. Breed, sex, age at the start of ASIT, and types of allergens in ASIT did not have a significant influence on efficacy of immunotherapy.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** ASIT should be recommended as a primary treatment option for canine atopic dermatitis and may allow reduction of coadministered antipruritic medications.
- 2** Regular follow-up examinations and guidance from a board-certified dermatologist can help ensure success of ASIT in dogs through routine monitoring for secondary bacterial and/or yeast dermatitis and regular adjustment of ASIT doses based on clinical response.
- 3** Chronic systemic glucocorticoids cause adverse effects in dogs. Results of this study suggest decreased efficacy of ASIT with concurrent glucocorticoid administration, prompting consideration of nonsteroidal allergy treatment options (eg, oclacitinib, cyclosporine) during the buildup phase of immunotherapy.

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4. Mueller RS, Bettenay SV. Long-term immunotherapy of 146 dogs with atopic dermatitis - a retrospective study. *Aust Vet Pract.* 1996;26:128-132.

Cytologic Diagnosis of Sepsis in Effusions

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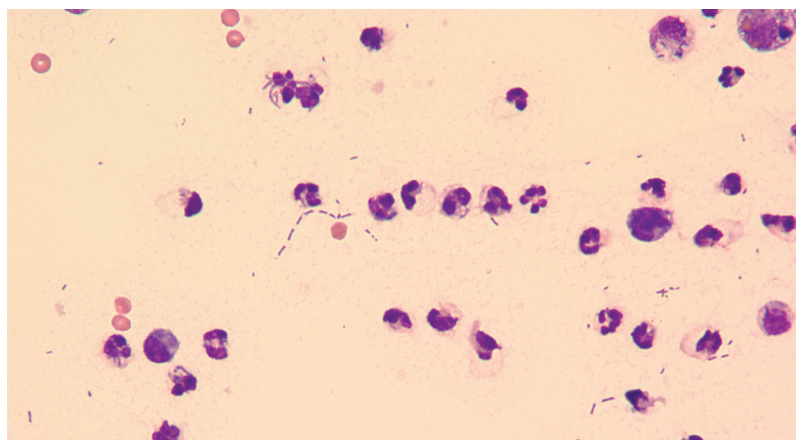
In the literature

Allen BA, Evans SJM. Diagnostic accuracy of cytology for the detection of bacterial infection in fluid samples from veterinary patients. *Vet Clin Pathol*. 2022;51(2):252-257. doi:10.1111/vcp.13092

FROM THE PAGE ...

Bacterial sepsis in dogs and cats can result in significant mortality depending on the anatomic location of the inciting infection.¹ Delaying diagnosis or treatment can be detrimental; in-clinic diagnostic tools are thus preferred for rapid diagnosis. Bacterial culture is the gold standard for diagnosis, but culture results can take several days, and some fluids (eg, joint fluid) can have poor diagnostic yield.

Although point-of-care assays are less specific and accurate than cytology with culture, effusion glucose and lactate may be useful biomarkers.¹⁻³ In a study, a



▲ **FIGURE** Direct smear from a pleural fluid sample showing degenerate neutrophils, as well as many extracellular and few intracellular bacterial organisms

blood-to-peritoneal fluid glucose difference of >20 mg/dL in dogs was 100% sensitive and specific for diagnosis of septic peritoneal effusion.¹ This metric should not be used in place of culture, but it may be valuable in addition to cytology.

In this study, fluids (eg, blood, CSF, synovial fluid, pleural fluid [**Figure**], peritoneal fluid) from 244 mammals (eg, horses, dogs, cats) were retrospectively evaluated to determine the sensitivity and specificity of cytology for diagnosis of bacterial sepsis. Bacterial culture was used as the reference method.

Overall sensitivity (42.6%) and specificity (93%) of cytology for identification of sepsis suggested that cytology may not be a useful screening test for detection in fluid samples. The authors concluded that cytology may help confirm, rather than rule out, bacterial infection in effusions.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Cytology can be a rapid, in-clinic method to evaluate effusions for bacteria, but bacterial sepsis cannot be ruled out if bacteria are not identified.
- 2** Culture of effusions is still considered the gold standard for diagnosing bacterial infection.

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Albuterol Toxicosis in Dogs

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In the literature

Crouchley J, Bates N. Retrospective evaluation of acute salbutamol (albuterol) exposure in dogs: 501 cases. *J Vet Emerg Crit Care (San Antonio)*. 2022. doi:10.1111/vec.13182

FROM THE PAGE ...

Albuterol (ie, salbutamol) is a selective beta-2-adrenoreceptor agonist commonly used in human medicine as a bronchodilator and in the management of preterm labor. Although albuterol has been used as a bronchodilator in dogs and cats, use in veterinary medicine is not common.¹ High doses of albuterol result in diminished beta-2 selectivity and activation of beta-1 adrenergic receptors, causing cardiovascular stimulation.² Systemic hypotension in response to albuterol-induced peripheral and coronary vasodilation can also contribute to increased heart rate.³ Hypokalemia may develop due to stimulation of sodium/potassium-ATPase via beta-2 adrenergic receptors.^{4,5}

Clinical signs of toxicosis are based on beta-agonist actions on adrenoceptors in various organs. Most organs are affected, but the cardiovascular system, musculoskeletal system, and CNS are primarily affected. Clinical signs include tachycardia, tachypnea, lethargy, vomiting, muscle tremors, ataxia, agitation, and polydipsia. Most dogs develop clinical signs within several hours of exposure.

This retrospective study evaluated onset and duration of common clinical signs, treatment, and outcome in 501 dogs with acute, accidental exposure to albuterol. Clinical signs developed in 471 dogs (94%) following albuterol exposure. Tachycardia was the most common clinical sign (404 dogs [80.6%]); median onset and duration were 2.5 and 13.3 hours, respectively. Tachypnea, dullness/lethargy, and vomiting were also common. Blood potassium concentration was measured in 142 dogs, and hypokalemia was reported in 106 dogs (median onset and duration were 2.4 and 13 hours, respectively). Beta-blockers, IV fluids, potassium supplementation, and sedation were the most common treatments. Survival rate among dogs with clinical signs was 99.6%.

... TO YOUR PATIENTS

Key pearls to put into practice:

1 Most dogs exposed to albuterol develop rapid-onset clinical signs but generally recover within 24 hours, and death is uncommon. Early assessment is recommended for all dogs with accidental exposure.

2 Beta-blockers are recommended in dogs with severe or prolonged tachycardia or with signs of reduced cardiac output/hypoperfusion (eg, pale mucous membranes, cold extremities, weak pulses, dull mentation) following albuterol exposure.

3 Serum potassium levels should be evaluated in all patients with clinical signs of toxicosis, and potassium supplementation should be considered in patients that are hypokalemic and have clinical signs (eg, muscle weakness, flaccid paralysis, hypoventilation) or ECG changes associated with hypokalemia (eg, prolonged QT interval, U waves, ST segment depression, increased P-wave amplitude and duration, bradycardia, AV block, cardiac arrest).

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3. Petruska JM, Beattie JG, Stuart BO, et al. Cardiovascular effects after inhalation of large doses of albuterol dry powder in rats, monkeys, and dogs: a species comparison. *Fundam Appl Toxicol*. 1997;40(1):52-62. doi:10.1006/faat.1997.2370
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Meroni ER, Khorzad R, Bracker K, Sinnott-Stutzman V. Retrospective evaluation of albuterol inhalant exposure in dogs: 36 cases (2007-2017). *J Vet Emerg Crit Care (San Antonio)*. 2021;31(1):86-93. doi:10.1111/vec.13012

Intrathoracic Wooden Skewers Migrating from the Stomach & Duodenum in Dogs

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In the literature

Garcia-Pertierra S, Das S, Burton C, et al. Surgical management of intrathoracic wooden skewers migrating from the stomach and duodenum in dogs: 11 cases (2014-2020). *J Small Anim Pract.* 2022;63(5):403-411. doi:10.1111/jsap.13474

FROM THE PAGE ...

When ingested, wooden skewers (eg, toothpicks, kebab sticks) can migrate from the GI tract to other parts of the body, creating diagnostic and therapeutic challenges and possibly leading to severe or life-threatening complications.

This retrospective study reviewed clinical presentation, management, and outcome of 11 dogs in which ingested wooden skewers migrated from the cranial GI tract to the thorax. Clinical signs included anorexia/hyporexia, vomiting/regurgitation, lethargy, pyrexia, and gait abnormalities/lameness. Median time from development of clinical signs to referral presentation was 14 days (range, 2-112 days).

The most common hematologic and serum chemistry abnormalities were neutrophilia with a left shift, thrombocytopenia, mild ALP elevation, and mild hypoalbuminemia. CT was more sensitive than other imaging modalities (ie, radiography, ultrasonography, MRI) for detecting skewers in the thorax, allowing for definitive

diagnosis in all dogs that underwent CT. The stomach was the most common site of migration; only one dog had a skewer that originated from the duodenum.

The authors recommend laparotomy with diaphragmotomy as the initial surgical approach unless the skewer is in the cranial thorax, in which case a median sternotomy or lateral thoracotomy is preferred.

Although these were complex cases managed at referral clinics, overall short- and long-term prognoses were good.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Dogs with intrathoracic wooden skewers migrating from the cranial GI tract can have diverse clinical signs with widely variable duration.
- 2** CT is the preferred imaging modality for detecting migrating wooden skewer foreign bodies in the thorax.
- 3** Surgical management of intrathoracic wooden skewers migrating from the cranial abdomen typically results in a good prognosis.

Suggested Reading

Hunt GB, Worth A, Marchevsky A. Migration of wooden skewer foreign bodies from the gastrointestinal tract in eight dogs. *J Small Anim Pract.* 2004;45(7):362-367. doi:10.1111/j.1748-5827.2004.tb00249.x

Lamb CR, Pope EH, Lee KCL. Results of computed tomography in dogs with suspected wooden foreign bodies. *Vet Radiol Ultrasound.* 2017;58(2):144-150. doi:10.1111/vru.12457

Once-Weekly Insulin Therapy in Dogs

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University of Georgia

In the literature

Hulsebosch SE, Pires J, Bannasch MJ, et al. Ultra-long-acting recombinant insulin for the treatment of diabetes mellitus in dogs. *J Vet Intern Med.* 2022;36(4):1211-1219. doi:10.1111/jvim.16449

FROM THE PAGE ...

Canine diabetes mellitus is traditionally managed with twice-daily insulin injections, but an intensive daily treatment schedule can negatively impact pet owner quality of life and perceived well-being of their pet.

This study* of 5 client-owned dogs evaluated once-weekly administration of a novel ultra-long-acting (ULA) insulin as an alternative to twice-daily insulin. All dogs were previously diagnosed with diabetes, had been treated with twice-daily insulin therapy for ≥ 2 months, and demonstrated moderate to good glycemic control. After enrollment in the study, dogs were maintained on a twice-daily insulin protocol and monitored with an implantable flash glucose monitoring system for 10 to 14 days. On day 0, dogs were transitioned to once-weekly ULA insulin, and the flash glucose monitoring system was continued. Weekly evaluation continued for 8 weeks and included full physical examination and measurement of serum drug concentration and antidrug antibody levels; ULA insulin was adjusted as needed based on glycemic monitoring, body weight, and clinical signs.

ULA insulin therapy maintained a similar level of glycemic and clinical control as compared with twice-daily insulin protocols. Serum ULA insulin concentrations associated with good glycemic control were achieved in all dogs following the second injection, with peak levels reached in week 3. Occurrence of hypoglycemia was not significantly different between baseline and study exit, with biochemical hypoglycemia (<70 mg/dL) occurring in 4.2% of all glucose readings, and a single episode of potential clinical hypoglycemia observed by an owner during the ULA insulin treatment phase.

*This study was funded by Akston Biosciences.

By week 6, one dog developed antidrug antibodies to ULA insulin and required twice-daily insulin during the final week to achieve glycemic control. The dog remained responsive to prestudy twice-daily insulin, but an attempt to restart ULA insulin after a 2-week washout period yielded no response, suggesting continued presence of antidrug antibodies. In addition, one dog had an incomplete response to ULA insulin therapy after 8 weeks and required intermittent administration of a porcine zinc (lente) insulin with meals.

Once-weekly (ie, ULA) insulin protocols offer a less rigorous treatment schedule for dogs with diabetes mellitus, but other factors—including treatment costs, effective monitoring of long-term therapy, and frequency of potential adverse effects (eg, treatment failure) in a larger population—should be evaluated.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1 A novel once-weekly insulin therapy maintained a similar level of diabetic control as compared with traditional twice-daily insulin injections in a small population of dogs. Efficacy of the novel insulin as a first-line therapy in uncontrolled diabetic dogs is unknown and was not evaluated.
- 2 Hypoglycemia was uncommon during the study period; however, some dogs managed with ULA insulin may require intermittent supplemental conventional insulin therapy to control postprandial hyperglycemia. ULA insulin alone may not be adequate for all dogs to achieve good glycemic control.
- 3 The once-weekly insulin was designed to be nonimmunogenic, but 1 out of 5 dogs formed antidrug antibodies and required supplemental twice-daily insulin in the final week of the study, warranting evaluation in a larger population of dogs.

Evaluating Euthanasia Decision-Making Using Veterinary Patient Medical Records

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In the literature

Gray C, Radford A. Using electronic health records to explore negotiations around euthanasia decision making for dogs and cats in the UK. *Vet Rec.* 2022;190(9):e1379. doi:10.1002/vetr.1379

FROM THE PAGE ...

Euthanasia is a common but emotionally stressful procedure in veterinary medicine. Although it is thus important to document conversations about euthanasia for thorough record keeping, these discussions and decision-making processes can be difficult to adequately record and evaluate.

This study reviewed electronic medical records from a veterinary surveillance database in the United Kingdom to determine the type of information (eg, whether the clinician or pet owner initiated the conversation, reason for euthanasia, negotiations for or against euthanasia) included in end-of-life discussions, specifically those in which euthanasia was delayed. Clinicians recorded components of conversations with owners that supported or opposed the decision to euthanize. Reasons for euthanasia included relief of suffering caused by systemic disease and subsequent decrease in quality of life, limited owner resources for continued care, and burden on the owner's time, emotional state, and energy.

Disagreements between clinicians and owners were included in some records, indicating a misalignment in perceptions of patient suffering and potential treatment

options. In cases in which euthanasia was considered the best course of action but was not performed immediately, recommendations were made for palliative care, and discussions regarding future plans for euthanasia were recorded.

Engaging in and recording conversations about euthanasia can be complex; a longer appointment may be needed to explore and document owner concerns and provide guidance. Detailed records can be beneficial, especially for subsequent clinicians who may refer to a patient's records to understand the full decision-making process if euthanasia was not elected.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Discussions about euthanasia, including reasons for or against, are an important part of patient records. Detailed notes can inform the team of the complexities that led to the discussion and help focus future consultations.
- 2** Clear communication is needed with the owner, and ethical implications of the decision to euthanize should be considered. It can be helpful to understand current euthanasia best practices and what factors owners prioritize when making decisions.
- 3** Palliative care should be considered prior to euthanasia. Relief of clinical signs (eg, pain, anxiety) can increase comfort at the end of life. Owners not ready to move forward with euthanasia may instead elect palliative care to improve patient welfare.

Suggested Reading

Knesl O, Hart BL, Fine AH, et al. Veterinarians and humane endings: when is it the right time to euthanize a companion animal? *Front Vet Sci.* 2017;4:45. doi:10.3389/fvets.2017.00045

Matte AR, Khosa DK, Coe JB, Meehan MP. Impacts of the process and decision-making around companion animal euthanasia on veterinary wellbeing. *Vet Rec.* 2019;185(15):480. doi:10.1136/vr.105540

Medical Futility in Small Animal Practice

Indu Mani, DVM, DSc

Editor

Clinician's Brief

In the literature

Peterson NW, Boyd JW, Moses L. Medical futility is commonly encountered in small animal clinical practice. *J Am Vet Med Assoc.* 2022;1-7. doi:10.2460/javma.22.01.0033

FROM THE PAGE ...

Futile medical care is treatment that is unlikely to have significant clinical benefit; futility can be qualitative (ie, low-quality benefit) or quantitative (ie, low likelihood of benefit). Although medical futility has been well studied in human medicine, evaluation in veterinary medicine is just beginning. Definitions of futile and nonbeneficial care can be nuanced and subjective.

This cross-sectional study sought to document clinician perceptions and understanding of medical futility, as well as to determine frequency in small animal



practice. An anonymous, 25-question online survey was distributed to members of the American College of Veterinary Emergency and Critical Care and ACVIM (small animal internal medicine and cardiology) with an invitation to share with colleagues. Analysis included 477 clinicians, 93.7% of whom were board-certified in a veterinary specialty.

Most respondents (99%) reported they believe futile care occurs in veterinary medicine, with 99.2% reporting encountering it in their practice career and 42.4% reporting occurrence >6 times annually. A majority of respondents (69.1%) disagreed or strongly disagreed that futile care is always wrong; 70.9% reported futile care can be an appropriate option. The frequency of futile care reported by this population emphasizes the need for a consensus definition of veterinary medical futility.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Although this study population included mostly board-certified clinicians, medical futility likely occurs regularly in general practice. Self-reflective practice tools and documentation to identify occurrence can inform profession-wide definitions of medical futility.
- 2** Clinicians should consider whether the provision of their care could be characterized as futile in specific situations and whether providing or refusing that care results in psychological distress. Support should be sought if distress occurs.
- 3** Definitions of futile care can be subjective and nuanced, necessitating targeted communication between veterinary staff and pet owners that considers the patient's best interests.

Moral Obligations Regarding Animal Suffering & Cruelty

Jim Reynolds, DVM, MPVM, DACAW
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In the literature

Whiting TL, Keane MA. Animal protection and mass depopulation. *Can Vet J.* 2022;63(8):859-862.

FROM THE PAGE ...

This report explored the dilemma associated with enforcing animal protection laws and discretionary application in cases of animal suffering, as well as what constitutes cruelty. An animal abuse case study illustrating enforcement of the Canadian Animal Care Act was used to demonstrate clinician responsibilities in applying animal protection statutes.

The case study involved the escape of a steer in rural Manitoba, Canada, from a barren paddock that contained no supplemental food. The owner deliberately struck the animal with his vehicle when returning the steer to the paddock, causing a spiral tibial fracture. On presentation, the leg was nonweight-bearing. The owner was unconcerned by the injury, stating slaughter was planned for the following day. The attending animal protection officer seized and humanely killed the animal under the Canadian Animal Care Act. The owner was prosecuted under the criminal code, pled guilty, and was fined with a probationary period precluding animal ownership.

Authors of this study applied ethical concepts from the case study to use of ventilation shutdown and steam heat (VSD+) for swine depopulation during the coronavirus disease (COVID-19) pandemic to illustrate moral obligations during mass killing of healthy animals. The authors proposed that the time from when pigs appear to become uncomfortable due to high temperatures until heat stress triggers grand mal seizure and death by multiorgan failure is incompati-

ble with normal agricultural practices and definitions of humane death, concluding that death by VSD+ is inhumane and can be considered animal cruelty.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Animal protection has broad public support and is regarded as a societal norm.
- 2** Humans entrusted with the care of animals, including clinicians, have obligations regarding humane care.
- 3** Clinicians attending patients suffering from pain or other severe welfare problems are obligated to medically correct the suffering or provide euthanasia (ie, humane ending of life) in a timely manner.
- 4** VSD+ results in severe, prolonged suffering before grand mal seizure and unconsciousness in sentient animals. This method is incompatible with definitions of humane death and can be considered animal cruelty.

Congenital Sensorineural Deafness in Purebred White Cats

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In the literature

Annemarie K, Liliana R, Małgorzata K, Andrzej P. Evaluation of the prevalence of congenital sensorineural deafness in a population of 72 client-owned purebred white cats examined from 2007 to 2021. *BMC Vet Res.* 2022;18(1):287. doi:10.1186/s12917-022-03378-2

FROM THE PAGE ...

There is a documented link between cats with a white haircoat and blue eyes and inherited congenital sensorineural deafness (CSD), in which cochlear degeneration occurs due to lack of functioning melanocytes.^{1,2} A white haircoat typically results from suppression of melanocyte development via the *KIT* gene (except in a form of albinism that occurs in Siamese, Birman,



and related breeds).^{2,3} Cats homozygous for the recessive wild-type allele (w/w) express normal pigmentation without any white.

White (W^D) and spotting white (W^S) are the other main alleles; both are dominant. W^D encodes for a completely white haircoat and may also result in one or both irises being blue, whereas W^S causes patchy loss of melanocytes, resulting in white regions or spots. W^S is dominant to w , and W^D is dominant to both w and W^S . Cats with an all-white phenotype thus have a W^D/W^D , W^D/W^S , or W^D/w genotype, and cats with spotted or patchy white areas have a W^S/W^S or W^S/w genotype.

Genetics for deafness in white cats is not yet determined, but there is a link between an all-white haircoat (W^D gene) and CSD.²⁻⁴ Homozygosity for W^D and the number of blue eyes present are associated with an increased risk for deafness.²⁻⁴ Not all blue-eyed white cats are deaf, however, suggesting these traits are also influenced by other genes.

Cats can have unilateral or bilateral deafness that is usually complete but may be partial.² Identifying deaf cats via brainstem auditory evoked response (BAER) testing is important for care of the cat (especially with bilateral deafness) and selection of cats for breeding. In studies of breeding white-haired domestic cats, 25% to 95% of white-haired offspring were deaf, depending on the genotype/phenotype of the parents.^{1,2,4-6}

This study examined 72 client-owned white purebred cats from 6 breeds (ie, Maine coon, Norwegian forest, sphynx, British shorthair, Devon rex, Cornish rex) in Poland. Based on BAER testing, 12 out of 72 (16.7%) cats had CSD (unilateral, 11.1%; bilateral, 5.6%). Sex, breed, and presence of blue eyes did not affect CSD prevalence. Prevalence in this study is lower than in previous studies (ie, 20.2%-30.3%) of white purebred cats from Germany and the United Kingdom.^{5,6}

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** BAER testing should be considered in purebred cats with white haircoats to exclude deaf cats from breeding programs.
- 2** This study found a relatively low prevalence of CSD and no apparent link to presence of blue eyes. This may reflect a bias in the population studied, as cats were presented for BAER testing prior to use in breeding programs, and owners may have already excluded cats with overt or suspected deafness.
- 3** Further studies are needed to explore the prevalence of CSD in client-owned pedigree and nonpedigree cats and to characterize the genotype of these cats.

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Dual Therapy for Cats at Risk for Arterial Thromboembolism

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In the literature

Lo ST, Walker AL, Georges CJ, Li RH, Stern JA. Dual therapy with clopidogrel and rivaroxaban in cats with thromboembolic disease. *J Feline Med Surg.* 2022;24(4):277-283. doi:10.1177/1098612X211013736

FROM THE PAGE ...

Cats with hypertrophic cardiomyopathy (HCM) often develop arterial thromboembolism (ATE). ACVIM guidelines for prevention of ATE recommend monotherapy with clopidogrel and addition of rivaroxaban in higher risk cats.¹ Dual therapy is recommended based on human medicine literature,² but there are no related studies in veterinary medicine.

This retrospective case series examined records of 32 cats administered clopidogrel and rivaroxaban on an outpatient basis that survived to discharge at a veterinary teaching hospital over 5 years. The study aimed to document adverse effects and clinical outcomes of dual therapy.

The only major adverse effects documented were bleeding diatheses, which affected 5 (15.6%) cats. Of these cats, rivaroxaban was discontinued in 1 cat, 1 cat died suddenly in the home, and 3 cats had clinical signs that self-resolved. None of these cats experienced recurrence of adverse effects, and 1 cat was alive at the end of the study.

Clinical outcomes in cats receiving dual therapy were generally positive. Eighteen cats had ATE prior to treatment. Of these, 3 (16.7%) developed an additional ATE. Cats with no history of ATE did not experience an ATE during treatment. Median survival time was 257 days for all cats starting dual therapy and 502 days for cats

with a prior ATE event. Cats receiving aspirin, warfarin, and/or heparin in a previous study had a median survival time of 184 days.³

Although this study was retrospective and included only a small number of cases, results show promise for treatment of cats with HCM and ATE. A 2-drug regimen may significantly decrease the risk for ATE development in cats.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1 ATE is not always fatal. Modern anti-thrombotic therapy can significantly increase patient life span, especially in cats with previous ATE. In this study, 50% of cats that experienced an ATE survived >1 year after the first ATE and initiation of dual therapy.
- 2 Dual therapy with clopidogrel and rivaroxaban appears to be well tolerated in cats. Relatively few adverse effects (eg, hematuria, epistaxis, hematemesis) were recorded, and most resolved without treatment adjustment.
- 3 Not all cats with HCM have high risk for development of ATE. Prompt diagnosis of high-risk cats is essential for providing necessary treatment (eg, dual therapy).

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Corticotropin-Releasing Hormone Test to Differentiate Hyperadrenocorticism in Dogs

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In the literature

Tanaka S, Suzuki S, Sato A, et al. Utility of a corticotropin-releasing hormone test to differentiate pituitary-dependent hyperadrenocorticism from cortisol-producing adrenal tumors in dogs. *J Vet Intern Med.* 2022;36(1):29-38. doi:10.1111/jvim.16336

FROM THE PAGE ...

Corticotropin-releasing hormone is produced in the hypothalamus and is a component of the hypothalamic–pituitary–adrenal axis. This hormone stimulates the release of ACTH from the pituitary gland, targeting the adrenal cortex and stimulating a hormonal response that includes release of cortisol and related glucocorticoid



hormones. Although some tests (eg, ACTH stimulation, dexamethasone suppression) that evaluate the hypothalamic–pituitary–adrenal axis may be familiar, others (eg, corticotropin-releasing hormone test) are infrequently used in the clinical setting.

This study evaluated the usefulness of a corticotropin-releasing hormone test for distinguishing pituitary-dependent hyperadrenocorticism (PDH) from hyperadrenocorticism caused by a cortisol-producing adrenal tumor (ie, adrenal-dependent hyperadrenocorticism [ADH]). Plasma ACTH was measured before and 30 minutes after IV injection of 1.5 µg ovine corticotropin-releasing factor.

Postinjection values increased significantly from baseline in all study groups (ie, control, PDH, ADH), demonstrating that ovine corticotropin-releasing hormone stimulated ACTH release. Baseline and postinjection ACTH were higher in the PDH group compared with the control and ADH groups. There was no difference in postinjection concentrations between the control and ADH groups.

Baseline and postinjection ACTH had moderate sensitivity (83.87%) and high specificity (96.97%) to distinguish between dogs in the PDH and control groups. Baseline ACTH had moderate sensitivity (90.62%) and specificity (87.50%) and postinjection ACTH had high sensitivity (100%) and moderate to low specificity (66.67%) to distinguish between dogs in the PDH and ADH groups.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** The corticotropin-releasing hormone test is not appropriate for initial diagnosis of hyperadrenocorticism in dogs. Diagnosis in dogs with appropriate clinical signs requires one or more clinically useful screening tests (eg, low-dose dexamethasone suppression, ACTH stimulation).
- 2** Common tests to differentiate PDH from ADH include high-dose dexamethasone suppression, endogenous ACTH concentration, and adrenal imaging. The corticotropin-releasing hormone test is clinically useful and an alternative differentiation test option. Overall sensitivity and specificity of the corticotropin-releasing hormone test are comparable with other differentiation tests.
- 3** Time needed for the corticotropin-releasing hormone test (ie, 30 minutes) is comparable to that needed for adrenal ultrasonographic examination and is significantly shorter than the 8-hour period required for the high-dose dexamethasone suppression test.
- 4** Lack of familiarity and experience with corticotropin-releasing hormone preparations and incomplete details regarding cost of testing may inhibit use. Further studies are needed before the corticotropin-releasing hormone test can be recommended for routine clinical practice.
- 5** Test performance, cost, logistics (eg, sampling times, availability of reagents and equipment), and convenience for the pet owner and veterinary staff should be considered when selecting a test to differentiate PDH from ADH.

Effect of Chronic Glucocorticoids on Serum Pancreatic Lipase Activity in Dogs

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In the literature

Cocker SE, Lawrence YA, Lidbury JA, Suchodolski JS, Steiner JM, Richter KP. Serum pancreatic lipase immunoreactivity in sick dogs after chronic administration of supraphysiologic doses of glucocorticoids. *Vet Clin Pathol*. 2022;50(Suppl 1):63-69. doi:10.1111/vcp.12943

FROM THE PAGE ...

Pancreatitis is often difficult to diagnose antemortem in dogs and can cause clinical signs that overlap with nonpancreatic diseases. Measurement of canine pancreatic lipase immunoreactivity (cPLI) concentration is the most sensitive (71.7%-77.8%) and specific (80.5%-88%) laboratory test for acute pancreatitis.¹ Data on the effects of exogenous glucocorticoids on cPLI concentrations in clinically ill dogs are conflicting; glucocorticoids are often administered for treatment of immune-mediated, inflammatory, and neoplastic diseases.²⁻⁴

This study assessed fasting serum cPLI concentration before (T0) and after (T1) chronic glucocorticoid (prednisone ± dexamethasone) administration in 35 dogs with diseases other than pancreatitis. Prednisone (≥0.5 mg/kg/day [0.5-3 mg/kg/day]) was administered for ≥3 weeks.

cPLI increase (absolute median change, 31 µg/L) following glucocorticoid administration was significant enough to change the clinical interpretation of cPLI results from T0 to T1 in 6 dogs (from within the reference interval [0-200 µg/L] to consistent with pancreatitis [>400 µg/L] in 3 dogs; from equivocal [200-400 µg/L] to consistent with pancreatitis in 1 dog; from consistent with pancreatitis to equivocal in 2 dogs).

There was no clinical suspicion of pancreatitis in any dogs regardless of change in cPLI concentration after chronic prednisone therapy in clinically ill dogs. The cause of increased cPLI in this population is unclear.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1 Chronic prednisone administration in dogs can cause an increase in cPLI concentration that can lead to a laboratory interpretation consistent with pancreatitis.
- 2 Chronic glucocorticoid administration is not associated with clinical signs of acute pancreatitis.
- 3 Routine measurement of cPLI concentration in dogs receiving prednisone is not recommended unless clinical signs consistent with acute pancreatitis develop.
- 4 Additional or alternate testing (eg, abdominal ultrasonography) for acute pancreatitis is recommended if signs of acute pancreatitis develop after chronic administration of prednisone.

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Prognosis of Dogs Presented with Hyperbilirubinemia

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In the literature

Brough A, Caraguel C, Ciaravolo S, Stickney A. Clinical findings and assessment of factors associated with survival in dogs presenting with hyperbilirubinaemia: 115 cases in Victoria, Australia (2015-2020). *Vet Rec Open*. 2022;9(1):e42. doi:10.1002/vro2.42

FROM THE PAGE ...

Significant disease is often present when bilirubin is increased enough to cause icterus (usually, $>34 \mu\text{mol/L}$ [2 mg/dL]) in veterinary patients. Prehepatic (eg, immune-mediated hemolytic anemia), hepatic (eg, copper-associated hepatopathy), and posthepatic (eg, extrahepatic biliary obstruction) differentials should be included in initial assessment of hyperbilirubinemic patients.

This retrospective study described clinical presentation and outcome of dogs ($n = 115$) with hyperbilirubinemia from 2 referral practices in Australia and sought to identify factors associated with survival. Clinical signs at presentation were nonspecific; vomiting, anorexia, lethargy, and fever were most common. Median patient age was 9 years, but a wide range (10 months to 16 years) was represented. Most dogs underwent advanced imaging (ie, abdominal ultrasonography [66.9%], abdominal CT scan [10.4%]). Liver biopsy (21.7%), fine-needle aspiration (11.3%), and tissue or bile culture (13.9%) were also performed.

Hepatic icterus was most common (44.3% of cases), followed by posthepatic (36.5%) and prehepatic (15.7%) icterus. Fifty-three dogs (46.1%) survived to discharge, and median survival time for all dogs was 40 days. Prehepatic hyperbilirubinemia (eg, due to immune-mediated hemolytic anemia, posttransfusion hemolysis, tiger snake envenomation) was associated with a significantly higher

risk for death compared with hepatic or posthepatic conditions.

Serum bilirubin $\geq 60 \mu\text{mol/L}$ (3.5 mg/dL) was associated with significantly decreased median survival time. This result supports the importance of hyperbilirubinemia in patient assessment and prognosis and suggests hyperbilirubinemia should be discussed with pet owners, regardless of underlying cause or disease process.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1 Hyperbilirubinemia indicates potentially significant disease, and the underlying cause should be determined quickly. Prehepatic, hepatic, and posthepatic differentials should be considered.
- 2 Prehepatic hyperbilirubinemia was associated with higher risk for death in this study. Prehepatic differentials can often be supported or excluded with a hematocrit test (ie, packed cell volume, total protein). Low packed cell volume with normal total protein is a strong indicator of RBC lysis.
- 3 A conversation with owners regarding prognosis should occur promptly in cases of hyperbilirubinemia. Severe elevations in total bilirubin and prehepatic hyperbilirubinemia are considered poor prognostic indicators of survival and may help owners make treatment decisions.
- 4 It is difficult to apply population statistics to individual cases. In this study, 41 dogs failed to survive to discharge, and 53 dogs were still alive when median survival (40 days) was calculated. Clinicians have a vital role in helping owners understand the implications of research when making treatment decisions for their pet.

Fine-Needle Aspiration to Detect Hepatitis in Dogs

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In the literature

Gardner RH, Castillo D, Constantino-Casas F, Williams TL. Can the neutrophil count from hepatic fine-needle aspirate cytology be used to diagnose hepatitis in dogs? A pilot study. *Vet Clin Pathol*. 2022;51(2):237-243. doi:10.1111/vcp.13087

FROM THE PAGE ...

Diagnosing disorders associated with hyperbilirubinemia, elevations in serum liver enzymes, or other hepatic laboratory abnormalities often requires evaluation of hepatic tissue. Biopsy (eg, ultrasound-guided, laparoscopic, laparotomic) obtains the best tissue for accurate diagnosis but may be contraindicated in patients with anesthetic or bleeding risks and can be cost prohibitive.^{1,2}



Fine-needle aspiration (FNA) is a cost-effective technique to collect tissue in a sedated patient and is often performed prior to biopsy. FNA has good sensitivity and specificity for diagnosis of focal disease or diffuse neoplasia (eg, round cell) but often underdiagnoses inflammatory disease and overdiagnoses vacuolar disease.³⁻⁶ Blood contamination (especially in FNAs performed using negative pressure) and neutrophils resulting from extramedullary hematopoiesis can complicate interpretation of neutrophil presence in hepatic FNA.⁷

This retrospective study examined a possible association between neutrophils on hepatic cytology and hepatitis or noninflammatory hepatopathy on histopathology, as well as a method for optimizing cytologic evaluation of hepatic FNA to accurately detect a clinically significant number of neutrophils. Only neutrophils within or in direct contact with a cluster of ≥ 5 hepatocytes were counted, and only clusters of hepatocytes arranged in an approximate monolayer were included; number of neutrophils per 200 hepatocytes was counted. The number of neutrophils in aspirates was compared with histopathologic diagnosis based on surgical biopsy. Neutrophil counts were significantly higher in FNAs from dogs with biopsy-proven inflammatory disease (7.7) compared with vacuolar disease (3.0). A neutrophil count of ≥ 6 per 200 hepatocytes was a highly specific (100%) but not sensitive (61.5%) indicator of hepatitis.

Larger studies are needed to validate these results and should include aspirates from dogs with other hepatic diseases, including hepatitis cases stratified based on the presence of acute or chronic inflammation on histopathology. Cytologic material obtained without negative-pressure aspiration should be collected from multiple lobes to account for heterogeneity seen with diffuse inflammatory disorders.^{8,9}

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Ultrasound-guided FNA of the liver is a simple, safe, noninvasive, and cost-efficient method of obtaining hepatic tissue for preliminary investigation of suspected hepatic disease in dogs.
- 2** FNAs should be performed using a nonnegative-pressure technique; >1 lobe should be sampled in patients with diffuse disease; and samples should be evaluated in a standardized manner by a boarded clinical pathologist. This study suggests counting neutrophils in direct contact with hepatocytes may be a sensitive predictor of inflammatory disease.
- 3** FNA cytology is ideal for diagnosing focal and diffuse (eg, round cell) neoplasia in dogs but may result in overdiagnosis of vacuolar hepatocytes and underestimation of chronic inflammation.

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Prognosis in Dogs with Caudal Lumbar Intervertebral Disk Extrusions

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In the literature

Pfund R, Forward AK, Fentem R, Nagendran A, Fraser AR, Crawford AH. Postoperative outcome of ambulatory dogs with intervertebral disc extrusion causing incontinence and/or tail dysfunction: 18 cases (2010-2020). *J Small Anim Pract.* 2022;63(7):550-558. doi:10.1111/jsap.13497

FROM THE PAGE ...

Intervertebral disk disease (IVDD) is common in dogs and can result in back pain, muscle weakness, and sensory deficits. An intervertebral disk is composed of a gelatinous nucleus pulposus surrounded by the annulus fibrosis. IVDD occurs when the nucleus pulposus degenerates and extrudes out of the annulus fibrosis and into the spinal canal. Extrusion location, contusive force of the extrusion, and compression of the spinal cord and/or nerve roots can cause clinical signs. The spinal cord in the caudal lumbar area terminates into the cauda equina, a group of nerves that may have higher capacity for repair.¹⁻⁴

This study retrospectively evaluated 18 dogs with IVDD in the caudal lumbar area (L4-S1) with urinary incontinence, fecal incontinence, and/or tail paresis or paralysis to determine the functional outcome of surgical treatment, as well as possible factors affecting outcome.

Cavalier King Charles spaniels and cocker spaniels were overrepresented in the study population. Fifty percent of dogs had extrusions at L5-L6. Duration of clinical signs before presentation ranged from 2 to 60 days. Median initial follow-up

time was 30 days, at which time 86% of dogs with urinary incontinence, 90% of dogs with fecal incontinence, and 87% of dogs with tail paresis or paralysis had regained full function. Dogs that did not fully recover had longer duration (≈ 28 days) of and more severe clinical signs (eg, combination of fecal and urinary incontinence with tail paresis) prior to presentation.

Although this study was small and retrospective, it provides evidence for a good prognosis in patients with caudal lumbar IVDD.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1 Dogs with caudal spinal IVDD and associated signs can recover full function of urinary and fecal continence with surgical intervention.
- 2 Cavalier King Charles spaniels and cocker spaniels may be more commonly affected by IVDD in the caudal lumbar region than other breeds.
- 3 Duration and severity of clinical signs prior to treatment can be prognostic indicators.

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Sternal Lymphadenopathy as a Prognostic Factor in Dogs with Splenic Malignancy

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In the literature

Kelsey J, Balfour R, Szabo D, Kass PH. Prognostic value of sternal lymphadenopathy on malignancy and survival in dogs undergoing splenectomy. *Vet Comp Oncol.* 2022;20(1):1-7. doi:10.1111/vco.12700

FROM THE PAGE ...

Hemangiosarcoma is a malignancy that originates from vascular endothelial cells. The spleen is the most commonly affected primary organ in dogs, but additional sites have also been reported.¹ Other splenic sarcomas (eg, fibrosarcoma, leiomyosarcoma, extraskelatal osteosarcoma, undifferentiated sarcomas) are nonangiomatous, nonlymphoid tumors of connective tissue.



Several prognostic factors (eg, hemoabdomen, multiple splenic lesions, imaging findings, anemia, thrombocytopenia) have been evaluated in dogs with splenic hemangiosarcoma, with clinical stage of disease consistently correlated with overall survival time. Dogs with advanced clinical stage have poor outcomes compared with dogs with stage I disease.^{2,3}

This retrospective study evaluated the clinical significance of sternal lymphadenopathy in 195 dogs undergoing splenectomy (most due to hemoabdomen), as well as prognostic significance in malignant splenic disease. Of these dogs, 102 (52.3%) were diagnosed with benign lesions, 74 (37.9%) were diagnosed with hemangiosarcoma, and 19 (10%) were diagnosed with malignancies other than hemangiosarcoma.

Incidence of sternal lymphadenopathy was 12.8% overall, 16.2% in the hemangiosarcoma group, 15.8% in the nonhemangiosarcoma malignancy group, and 9.8% in the benign process group.

Although sternal lymphadenopathy was not a predictor for malignancy in dogs with hemoperitoneum, dogs diagnosed with both hemangiosarcoma and sternal lymphadenopathy had shorter survival compared with dogs with hemangiosarcoma without sternal lymphadenopathy. Sternal lymphadenopathy may therefore have predictive value for survival of dogs with splenic malignancy.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Sternal lymphadenopathy is not a predictor of malignancy in dogs with splenic masses, with or without hemoperitoneum.
- 2** Etiology of sternal lymphadenopathy is unknown. Microscopic evaluation is needed to rule out reactive versus metastatic disease processes.
- 3** Dogs diagnosed with both splenic hemangiosarcoma and sternal lymphadenopathy on thoracic radiographs had shorter survival compared with dogs without radiographic evidence of sternal lymphadenopathy.

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Although sternal lymphadenopathy was not a predictor for malignancy in dogs with hemoperitoneum, dogs diagnosed with both hemangiosarcoma and sternal lymphadenopathy had shorter survival compared with dogs with hemangiosarcoma without sternal lymphadenopathy.

Differential Clinical Staging for Dogs with Low- & High-Risk Mast Cell Tumors

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In the literature

Fejös C, Troedson K, Ignatenko N, Zablotski Y, Hirschberger J. Extensive staging has no prognostic value in dogs with low-risk mast cell tumours. *Vet Comp Oncol.* 2022;20(1):265-275. doi:10.1111/vco.12773

FROM THE PAGE ...

Cutaneous mast cell tumors (MCTs) are the most common type of malignant skin tumor in dogs.¹ Predicting canine MCT behavior can guide therapeutic recommendations and provide realistic expectations for achieving long-term disease control or cure. Several positive or negative prognostic patient and tumor factors are typically used to predict aggressiveness of MCTs. Qualitative and quantitative assessment of prognostic factors can justify the magnitude of therapeutic interventions (eg, surgery, radiation, chemotherapy, receptor tyrosine kinase inhibition) for disease management; however, the role of prognostic factors in guiding the extent of diagnostic tests for clinical staging of canine MCTs is incompletely defined.

This retrospective study examined the outcome prediction value of diagnostic tests (ie, abdominal ultrasonography, spleen and/or liver aspiration, thoracic radiography, regional lymph node cytology) commonly recommended for complete staging in dogs with high- and low-risk MCTs. The study also evaluated the association between negative prognostic factors and development of distant metastases, as well as factors that may influence long-term survival.

Dogs diagnosed with high-risk (ie, presence of a negative prognostic factor [ie, high grade, lymph node metastasis, rapid growth, ulceration, recurrence, high-risk location]) MCTs were more likely to be presented with or develop distant metastases

and achieved shorter survival times compared with dogs with low-risk (ie, no negative prognostic factors) MCTs. Extensive clinical staging did not provide actionable prognostic value in dogs with low-risk MCTs. The authors concluded that extensive clinical staging in dogs with low-risk MCTs is likely unnecessary and does not improve prognostication. These findings provide guidelines for improving clinical assessment of dogs diagnosed with MCTs of variable biologic behaviors.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1 MCTs in dogs can demonstrate divergent biologic behaviors, ranging from locally benign to distantly metastatic, that can often be predicted by identification of positive and negative prognostic variables.
- 2 Dogs with high-risk MCTs are more likely to develop regional and distant metastases and succumb to terminal disease burdens more quickly than dogs diagnosed with low-risk MCTs.
- 3 Clinical staging is important for determining the location and magnitude of cancer burden; however, the extent of diagnostic tests performed should be based on patient and tumor prognostic factors.

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Liquid Biopsy for Cancer Detection in Dogs

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In the literature

Flory A, Kruglyak KM, Tynan JA, et al. Clinical validation of a next-generation sequencing-based multi-cancer early detection “liquid biopsy” blood test in over 1,000 dogs using an independent testing set: the CANcer Detection in Dogs (CANDiD) study. *PLoS One*. 2022;17(4):e0266623. doi:10.1371/journal.pone.0266623

FROM THE PAGE ...

Liquid biopsy methods test for disease markers in blood and are used for early cancer detection in humans. Liquid biopsy can detect cell-free DNA (ie, portions of DNA shed from cells that circulate in the bloodstream).

This study* was designed to validate performance of a novel, commercially available liquid biopsy test for noninvasive detection and characterization of multiple cancers in dogs. An international heterogeneous population of dogs with and without cancer was enrolled. Plasma was collected from dogs that met inclusion criteria, with samples from 876 dogs used to test performance analysis. Cell-free DNA was extracted from plasma samples, and next-generation sequencing was used to compare DNA sequences from patient genomic DNA and cell-free DNA. Bioinformatic algorithms were used to determine whether patient samples showed a positive (ie, cancer signal detected) or negative (ie, cancer signal not detected) result.

Overall sensitivity was 54.7% and specificity was 98.5%. Although sensitivity was low, most dogs with cancer had local or locoregional disease; these patients may have inherently less cell-free DNA than dogs with widespread disease. Sensitivity was 85.4% in patients with cancers (ie, lymphoma, hemangiosarcoma, osteosarcoma) typically associated with systemic involvement at diagnosis.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1 Measuring cell-free DNA with a blood test may lead to improved outcomes in cancer patients, especially those with aggressive tumors.
- 2 Liquid biopsy can be used for cancer screening and may lead to earlier detection of disease and relapse and an improved outcome. In this study, 2 out of 10 presumed healthy dogs were diagnosed with cancer after undergoing a confirmatory cancer evaluation triggered by a positive liquid biopsy result.
- 3 A positive liquid biopsy result may be challenging to confirm due to limitations in imaging sensitivity and thus may not result in immediate therapeutic action.

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*This study received funding from PetDx.

Sports Ball Projectile Ocular Injuries in Dogs

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In the literature

Chan RX, Ledbetter EC. Sports ball projectile ocular trauma in dogs. *Vet Ophthalmol.* 2022;25(5):338-342. doi:10.1111/vop.12987

FROM THE PAGE ...

Ocular trauma is common in dogs, and all ocular structures are vulnerable to injury after trauma to the eye. Some injuries (eg, iris rupture) may cause few effects, but more extensive lesions (eg, glaucoma, retinal detachment) can result in a nonfunctional eye. Uveitis is common with ocular trauma and should be aggressively managed to prevent complications.¹ Limited studies have reported eye injuries (eg, retinal detachment, hyphema) secondary to blunt and penetrating forces (eg, gunshots, cat clawing, bomb explosions).²⁻⁴

This retrospective study described prognostic indicators and visual outcomes of dogs with sports ball projectile ocular injuries. Closed-globe injuries ($n = 12$) were more common than open-globe injuries ($n = 6$); were commonly presented with traumatic uveitis, hyphema, and subconjunctival hemorrhage; and were medically



▲ **FIGURE 1** Hemorrhagic periocular discharge, elevated third eyelid with extensive conjunctival hemorrhage, severe chemosis, uveitis with marked miosis, and a superficial corneal ulcer stained with fluorescein seen in an 8-year-old spayed Australian shepherd with closed globe blunt trauma to the left eye. *Image courtesy of Auburn University*



▲ **FIGURE 2** Periocular serous discharge, extensive deep corneal edema, and hyphema seen in a dog with an open-globe, full-length vertical corneal laceration secondary to blunt trauma. *Image courtesy of Auburn University*

managed. Vision was maintained in 67% of cases. Open-globe injuries included corneal lacerations and scleral rupture, and all affected eyes required enucleation except one, which was managed with corneal laceration repair and third eyelid flap placement prior to referral (vision was maintained).

Injuries from small, dense sports balls (eg, golf balls, baseballs) were associated with a guarded prognosis and required more aggressive medical management compared with injuries from lighter balls (eg, tennis balls, toy balls). Traumatic uveitis was the most common initial ocular lesion and had varying visual outcomes. Hyphema was the second most common initial ocular injury and carried a poorer visual prognosis than traumatic uveitis.

Injuries from small, dense sports balls (eg, golf balls, baseballs) were associated with a guarded prognosis and required more aggressive medical management compared with injuries from lighter balls (eg, tennis balls, toy balls).

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Compared with trauma from lighter sports balls, ocular trauma from small, dense sports balls typically results in more extensive injury and more frequent initial presence of hyphema and is often associated with enucleation or a poor visual prognosis.
- 2** Open-globe injuries have a poor visual prognosis and often result in enucleation.
- 3** Ocular ultrasound and CT scans can help identify vitreal hemorrhage, retinal detachment, retinal hemorrhage, scleral rupture, and orbital wall fractures that may not be clinically evident.

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Neurogenic Keratoconjunctivitis Sicca in Dogs

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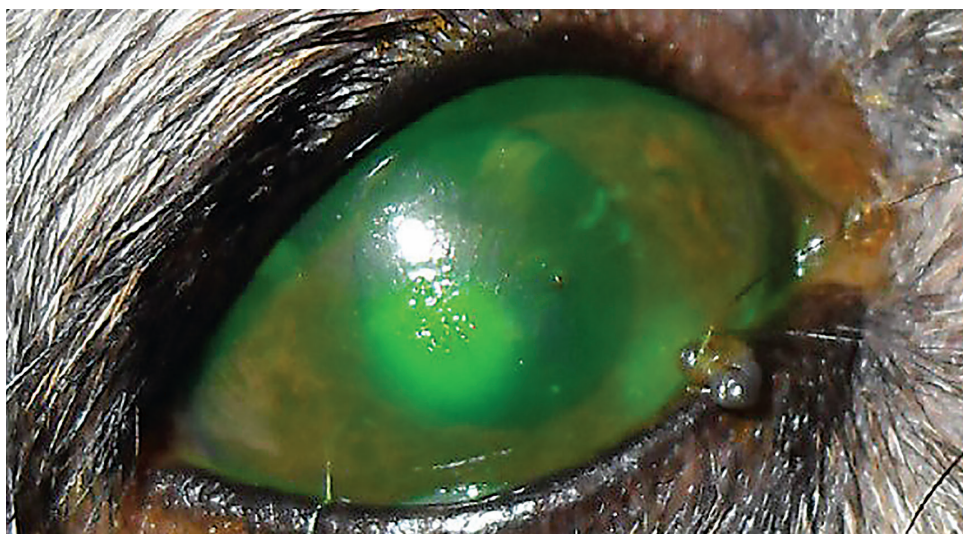
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Galley AP, Beltran E, Pont RT. Neurogenic keratoconjunctivitis sicca in 34 dogs: a case series. *Vet Ophthalmol.* 2022;25(2):140-152. doi:10.1111/vop.12949

FROM THE PAGE ...

Quantitative keratoconjunctivitis sicca (KCS), a deficiency of the aqueous portion of the precorneal tear film, is common in dogs. Possible neurogenic causes are not often recognized or considered.

Lacrimal and nictitans glands, lateral and mucosal nasal glands, and palatine glands are innervated by postganglionic parasympathetic fibers of the facial nerve. Damage or trauma to these fibers may



lead to neurogenic KCS, which causes typical clinical signs of KCS (eg, mucopurulent ocular discharge, blepharospasm, conjunctival hyperemia, corneal neovascularization or ulceration). The ipsilateral nostril is typically dry and crusty (ie, xeromycteria), indicating decreased function of mucosal nasal glands.

This retrospective study analyzed ocular and neurologic signs, diagnostic imaging findings, underlying conditions, and response to treatment in 34 dogs with neurogenic KCS. Ocular signs of KCS were present in all dogs, and neurologic signs (eg, facial neuropathy, peripheral vestibular syndrome, Horner syndrome) were identified in 52.9% of dogs. MRI or CT was performed to further investigate neurologic signs in 18 dogs. Based on patient history, clinical signs, and available imaging findings, suspected etiologies for neurogenic KCS included chronic otitis interna/media, iatrogenic facial nerve damage after total ear canal ablation and lateral bulla osteotomy, head trauma, brainstem tumor, and an area of inflammation in the pterygopalatine fossa.

Treatment was administered to 30 dogs. Response to a lacrimostimulant (cyclosporine 0.2% or tacrolimus 0.05%) alone was poor in the 4- to 10-month treatment period. Oral pilocarpine 2% with or without a lacrimostimulant, however, led to improved clinical signs, improved Schirmer tear test results, and resolution of xeromycteria in 48% of the 23 dogs available for follow-up.

In addition to typical signs of keratoconjunctivitis sicca, affected dogs may exhibit ipsilateral xeromycteria and neurologic signs.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Neurogenic KCS is caused by damage to the preganglionic parasympathetic fibers of the facial nerve that innervate the ocular tear glands, mucosal nasal glands, and palatine glands. In addition to typical signs of KCS, affected dogs may exhibit ipsilateral xeromycteria and neurologic signs.
- 2** Results from this study suggest neurogenic KCS is common in older (>8 years of age) dogs, small dogs, and crossbreed dogs, with a potential breed predisposition in English cocker spaniels and Cavalier King Charles spaniels. Underlying endocrinopathy (eg, hypothyroidism, diabetes mellitus) may also predispose patients to peripheral neuropathies and subsequent neurogenic KCS. Advanced imaging (eg, CT, MRI) may help investigate the underlying cause of neurogenic KCS, but the condition is often idiopathic.
- 3** Oral pilocarpine is the treatment of choice for neurogenic KCS and is preferable in combination with a lacrimostimulant (ie, cyclosporine, tacrolimus). The ophthalmic preparation of pilocarpine 2% is initially administered at 1 drop/10 kg (0.1 drop/kg) PO every 12 to 24 hours with food, increased by 1 drop every 1 to 3 days until systemic adverse effects (eg, hypersalivation, vomiting, diarrhea) are noted, then decreased to the previous dose for maintenance.

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Risk for Alveolar Echinococcosis in Dog Owners

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In the literature

Schmidberger J, Uhlenbruck J, Schlingeloff P, et al. Dog ownership and risk for alveolar echinococcosis, Germany. *Emerg Infect Dis.* 2022;28(8):1597-1605. doi:10.3201/eid2808.212514

FROM THE PAGE ...

Echinococcus multilocularis is a zoonotic tapeworm predominantly found in the Northern Hemisphere that causes alveolar echinococcosis (AE), a serious disease in humans primarily treated with invasive surgery.¹ AE in humans is highly prevalent in China (≈90% of global burden) and of notable concern in Europe.^{1,2} *E multilocularis* is less common in North America (documented in wildlife in ≈14 US states and 4 Canadian provinces), but its range is expanding in the central United States and Canada.²



E multilocularis is maintained in a predator-prey cycle in which the definitive host (ie, dogs, wild canids [typically foxes], cats [rare]) excretes eggs after consuming infected small mammals.^{1,2} Humans can then be infected via ingestion of the eggs, potentially through contaminated soil, food, water, fomites, or close contact with definitive hosts.¹⁻³ Previous studies demonstrated an association between ownership of or contact with dogs and AE in humans.⁴⁻⁷

This case-controlled study in Germany conducted a written survey of dog owners with ($n = 43$) and without ($n = 214$) AE to further explore potential risk factors for AE in dog owners. No difference was found between the groups when duration of ownership and regular contact with dogs were examined. Never testing a dog's feces for parasites and reduced deworming frequency were not risk factors for AE. Although risk for AE increased 7-fold in owners who never cleaned their dog's coat compared with those who cleaned daily, this difference was not significant. There was also a nonsignificant increase in risk in owners in rural communities (likely due to proximity to wildlife reservoirs) and owners of dogs that ate carrion or rodents.

Risk for AE was 7-fold higher in owners with herding dogs or dogs that roamed unattended in fields. Increased risk was 13-fold in owners of dogs that consumed organic waste from other animals daily. There was a 4-fold increase in risk in owners who only sought veterinary care when their dog was ill compared with those who sought care more than once per year. Owners who did not receive information from their clinician regarding risk for and prevention of *E multilocularis* infection had a 10-fold increased risk.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Clinicians can help reduce *E multilocularis* infection by educating dog owners about the parasite, including risk factors for infection and transmission, as well as preventive measures.
- 2** Owners should not allow dogs to roam fields unattended, roll in feces of other animals, or eat carrion or prey.
- 3** One study found that monthly treatment of dogs in hyperendemic areas with praziquantel can reduce both *E multilocularis* shedding in dogs and prevalence of *E multilocularis* in intermediate wildlife hosts.⁸

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GI Perforation Following NSAID Administration in Dogs

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In the literature

Pfeifer JM, Levy NA, Carter DL, Beal MW. Gastric or duodenal perforation and secondary septic peritonitis following therapeutic nonsteroidal anti-inflammatory drug administration. *J Vet Emerg Crit Care*. 2022. doi:10.1111/vec.13217

FROM THE PAGE ...

NSAIDs inhibit the COX enzyme in the arachidonic acid pathway, and those used in dogs are generally selective for COX-2, the isoenzyme induced during inflammation. These drugs can be beneficial, but adverse effects (eg, gastric and duodenal perforation [GDP]; rare) may limit their use. Although several studies have linked GDP to various individual NSAIDs,¹⁻⁴ none have examined the relationship between GDP and the frequency at which different NSAIDs are prescribed.



This study retrospectively evaluated GDP cases at a university teaching hospital over a 13-year period. Data were collected on the specific NSAID prescribed, dosage, and concurrent medications, including glucocorticoids and other NSAIDs. Local referral clinics were also surveyed to determine which NSAIDs were most frequently prescribed to dogs during the same period.

Thirty cases met inclusion criteria; 18 dogs were administered a single NSAID at the recommended dose. Of those, 8 received meloxicam, 5 received firocoxib, 3 received deracoxib, and 2 received piroxicam. Eight dogs received a combination of NSAIDs (including carprofen) and/or NSAIDs plus glucocorticoids. Only 4 dogs were administered an NSAID overdose (ie, $\geq 10\%$ above the high end of the labeled dose). Survival rate of dogs with GDP was 66.7%.

Although carprofen was the most frequently prescribed NSAID during the corresponding time period (70.6% of reported prescriptions), no cases of GDP were associated with carprofen administered as a single agent. Other NSAIDs prescribed by survey respondents, in decreasing order of frequency, were meloxicam, deracoxib, firocoxib, aspirin, and other.

Results indicate need for awareness of potential GDP in dogs given NSAIDs. Meloxicam, firocoxib, and deracoxib are selective for the COX-2 isoenzyme but were associated with development of GDP. Carprofen was not associated with GDP when given alone but may lead to GDP when combined with glucocorticoids or other NSAIDs.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** NSAID administration can lead to GDP in dogs, even at the labeled dose. NSAIDs more commonly associated with GDP (in descending order of frequency) are meloxicam, firocoxib, deracoxib, and piroxicam.
- 2** COX-2-selective drugs are considered safer than nonselective alternatives and were administered to most patients in this study. Appropriate caution and monitoring for adverse effects should be used when administering any NSAID to dogs.
- 3** Single-agent carprofen was not associated with GDP despite being the most commonly prescribed drug but was associated with GDP when coadministered with glucocorticoids or other NSAIDs. Concurrent administration of these drugs is thus not recommended due to increased risk for GDP and other adverse effects.

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Although carprofen was the most frequently prescribed NSAID during the corresponding time period (70.6% of reported prescriptions), no cases of GDP were associated with carprofen administered as a single agent.

Effect of Preappointment Gabapentin in Hyperthyroid Cats

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In the literature

Gurney M, Gower L. Randomised clinical trial evaluating the effect of a single preappointment dose of gabapentin on signs of stress in hyperthyroid cats. *J Feline Med Surg.* 2022;24(6):e85-e89. doi:10.1177/1098612X221091736

FROM THE PAGE ...

Diagnosis and management of hyperthyroidism in cats requires drawing blood, testing urine, measuring blood pressure, auscultating the heart, and/or performing ultrasonography on the heart or kidneys. Handling or restraining noncompliant cats can make completing these procedures difficult and may result in increased patient stress or anxiety.

This study evaluated the effectiveness of gabapentin for reducing stress in hyperthyroid cats at the clinic. Cats ($n = 47$) were randomly placed into groups given either placebo or gabapentin; owners and veterinary nurses were unaware of treatment group assignments. On the first visit, cat owners were asked to provide baseline temperament and transport scores. For the second visit, owners administered either liquid gabapentin (20 mg/kg PO) or an identical placebo one hour before leaving the home. Two veterinary nurses assigned compliance scores after handling the patient, including for blood collection and blood pressure measurement via Doppler.

Groups had no significant difference in age, sex, body mass, baseline temperament, travel time, or baseline transport score. Transport and compliance scores following administration of gabapentin differed significantly between groups.

Blood levels of gabapentin were measured in all but 2 cats in the gabapentin group and correlated with transport and compliance scores. These findings are similar to other published studies on the effects of gabapentin in owned and feral cats.^{1,2}

This study excluded cats with chronic renal disease and hypertrophic cardiomyopathy, which may be associated with hyperthyroidism. Additional studies are needed to evaluate the safety of gabapentin in these patients.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Gabapentin (20 mg/kg PO) given to healthy and hyperthyroid cats one hour prior to arrival at the clinic may significantly reduce stress and increase compliance with handling and examination.
- 2** Hyperthyroid cats without significant systemic comorbidities appear to have good tolerance of premedication with gabapentin.

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Trazodone & Veterinary Examination Stress in Dogs

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In the literature

Kim S-A, Borchardt MR, Lee K, Stelow EA, Bain MJ. Effects of trazodone on behavioral and physiological signs of stress in dogs during veterinary visits: a randomized double-blind placebo-controlled crossover clinical trial. *J Am Vet Med Assoc*. 2022;260(8):876-883. doi:10.2460/javma.20.10.0547

FROM THE PAGE ...

Difficulty transporting a pet to the clinic and associated stress of the patient and pet owner can be barriers to routine veterinary care.¹ Stress-reduction techniques can benefit the clinic, patient, and owner.



This double-blinded, placebo-controlled crossover study evaluated the impact of trazodone (9-12 mg/kg PO once) administered to dogs 90 minutes prior to transport to the clinic for complete physical examination with physiologic measurements (eg, heart rate, serum cortisol). Each dog was given trazodone or placebo in random order prior to 2 separate clinic visits one week apart, allowing each dog to serve as its own control.

Examinations were video recorded, and behavior analysis was performed by blinded observers who showed fair agreement in scoring. Owners scored personal and pet stress, and investigators scored patient sedation, aggression, and compliance during examination.

Based on owner scoring and observer video analysis, patient stress scores during examination were significantly lower in dogs given trazodone; however, scoring by investigators was unchanged in dogs receiving placebo versus trazodone. In dogs receiving trazodone, respiratory rates were significantly lower and mean heart rates were higher; no other significant differences in physiologic variables were noted.

Preventing escalation and alleviating patient and owner stress can allow more effective, humane care and increase owner compliance.

... TO YOUR PATIENTS

Key pearls to put into practice:

1 Many dogs (63%-78.5%) entering the clinic show signs of stress and anxiety,^{2,3} which can alter physiologic measurements and lead to fear and aggression directed at clinic staff and owners. Owners may therefore delay or avoid bringing their pet to the clinic.¹ Previsit medication should be administered when indicated.

2 This study used a larger dose of trazodone (9-12 mg/kg) than is recommended (2-3 mg/kg) for adjunct treatment of canine anxiety, stress management during hospitalization, or postsurgical confinement.⁴⁻⁷ Nonetheless, the only reported adverse effect was diarrhea in one dog 4 hours after administration that resolved without additional treatment. No severe or fatal adverse effects have been reported in studies evaluating trazodone as a previsit medication.^{4,7,8}

3 Owners should be educated on how to alleviate stress and anxiety in their dogs. Previsit medications should be offered when signs of distress are detected. Preventing escalation and alleviating patient and owner stress can allow more effective, humane care and increase owner compliance.

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Impact of Fatigue in Veterinary Practice

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In the literature

Scharf VF, McPhetridge JB, Dickson R. Sleep patterns, fatigue, and working hours among veterinary house officers: a cross-sectional survey study. *J Am Vet Med Assoc*. 2022;260(11):1377-1385. doi:10.2460/javma.21.05.0234

FROM THE PAGE ...

The impact of sleep deprivation is a concern among healthcare professionals and has been extensively studied in human medicine, particularly in medical residents.¹⁻³ Adults should sleep a minimum of 7 hours every night.⁴

This study investigated the correlation between sleep patterns of veterinary residents and interns with perceptions of fatigue during working hours. Rotating interns and residents training in a variety of clinical specialties at AVMA-accredited small- and large-animal teaching hospitals were surveyed; 303 responses were received from participants at 9 institutions. Sleep patterns,



working hours, and perceptions of fatigue were examined for potential targeted intervention to improve well-being.

The majority of respondents reported working 11 to 13 hours per day, 5 to 7 days per week. Emergency and critical care residents were more likely to work >14 hours per day. Most respondents were on call 8 to 14 days each month and reported adequate caseloads for professional development. Respondents slept an average 6 hours per night when working in the clinic and 7.5 hours per night when not working in the clinic. On-call duties interfered with perceived sleep quality in many respondents. Fatigue was reported to interfere with clinical judgment and technical skills; 40% of respondents reported loss of empathy.

Sleep supports cognitive health; this study indicates long working hours and sleep deprivation may impair professional training of interns and residents. Loss of empathy has been previously associated with burnout.⁵⁻⁷ Further studies are needed to determine the effects of sleep deprivation on mental health, as well as the increased risk for self-injury or medical errors that may impact patient care.

Fatigue was reported to interfere with clinical judgment and technical skills; 40% of respondents reported loss of empathy.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Healthy sleep patterns support learning new information, performing learned tasks, and making good decisions, thus allowing effective communication with pet owners and appropriate patient care.
- 2** Industry changes (eg, flexible scheduling, protected off-clinic days, increased technical support) in overnight patient care and distribution of on-call responsibilities should be considered to maximize opportunities for sleep and improvement in mental health, as well as to minimize likelihood of burnout.
- 3** Sleep habits developed during training may be sustained throughout the professional career, impacting long-term well-being, job performance, physical health, and patient care.

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Impact of Feline Onychectomy Bans

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In the literature

Ellis A, van Haaften K, Protopopova A, Gordon E. Effect of a provincial feline onychectomy ban on cat intake and euthanasia in a British Columbia animal shelter system. *J Feline Med Surg.* 2022;24(8):739-744. doi:10.1177/1098612X211043820

FROM THE PAGE ...

Feline onychectomy (ie, declawing) is controversial and presents an ethical dilemma. Pet owners may request declawing to prevent or manage destructive scratching behaviors, but patient welfare with elective amputation of digits should be considered. Refusal to perform the procedure and instead attempting to manage unwanted behaviors can result in frustrated owners choosing to euthanize or relinquish destructive cats. As more municipalities prohibit onychectomy, it is critical to understand and acknowledge the implications.

This study compared rates of and reasons for relinquishment and owner-requested euthanasia at multiple shelters in a single province in Canada 3 years before and 3 years after a legislative ban on onychectomy. The study aimed to determine whether the rate of relinquishment and euthanasia increased, as well as whether relinquishment increased due to destructive behavior.

Results demonstrated no significant difference in relinquishment or owner-requested euthanasia. Destructive behavior was an uncommon primary reason for surrender, comprising only 0.18% of surrendered cats over the study period; there was no significant increase after the ban. This may suggest most owners are able to manage or accept scratching behaviors, and withholding the option to declaw is unlikely to increase relinquishment or euthanasia; however, the study did not include cats that may have been declawed illegally, rehomed

privately or through alternative welfare organizations, or released outside by owners because of unwanted scratching behaviors.

Future research should investigate whether owners who surrendered or euthanized cats due to destructive scratching would have pursued onychectomy if available, as owners of these cats may not have been committed to declawing, lessening justification of the procedure.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Scratching is natural behavior in cats. New cat owners should be educated to expect this behavior and understand early management interventions.
- 2** There are short- and long-term welfare concerns with onychectomy, regardless of method or pain medication administered. Recently graduated clinicians are unlikely to be confident and able to perform this procedure as it continues to be removed from veterinary curricula. Hospitals will likely rely on experienced clinicians to perform the procedure or teach new practitioners willing to learn.
- 3** Relinquishment is usually related to owner concerns (eg, housing, financial challenges). Access to veterinary care and pet friendly housing are critical for preventing unnecessary relinquishment and euthanasia.

Suggested Reading

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Martell-Moran NK, Solano M, Townsend HG. Pain and adverse behavior in declawed cats. *J Feline Med Surg.* 2018;20(4):280-288. doi:10.1177/1098612X17705044

Wilson DV, Pascoe PJ. Pain and analgesia following onychectomy in cats: a systematic review. *Vet Anaesth Analg.* 2016;43(1):5-17. doi:10.1111/vaa.12314

Grape & Raisin Toxicosis in Dogs: A Possible Connection with Cream of Tartar & Tamarinds

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In the literature

Wegenast CA, Meadows ID, Anderson RE, Southard T, González Barrientos CR, Wismer TA. Acute kidney injury in dogs following ingestion of cream of tartar and tamarinds and the connection to tartaric acid as the proposed toxic principle in grapes and raisins. *J Vet Emerg Crit Care (San Antonio)*. 2022. doi:10.1111/vec.13234

FROM THE PAGE ...

Tartaric acid is an organic acid found in various plants; high concentrations are found in grapes (range, 0.35%-1.1%; $\leq 2\%$ is possible) and tamarinds (range, 8%-18%).¹⁻³ Tartaric acid can precipitate into salts, including potassium bitartrate (ie, cream of tartar), a common baking ingredient.^{4,5}

This case series described 6 dogs exposed to tartaric acid via ingestion of cream of tartar, tamarind pods, or tamarind paste and considered whether tartaric acid and its salts could be the components of grapes and tamarinds that are toxic to dogs. All dogs began to vomit within 1 to 14 hours of exposure. Azotemia was noted 18 to 53 hours after exposure, and 3 dogs developed oliguria or anuria despite receiving IV fluids and supportive care. Four dogs were euthanized, and 2 were lost to follow up. Necropsy was performed on 3 dogs; histopathology of the kidneys showed severe cortical tubular degeneration and necrosis. Histopathology in dogs after grape and raisin exposure consistently demonstrates moderate to severe diffuse renal tubular degeneration, especially in the proximal tubules. Proteinaceous and

cellular debris in some tubule lumens, as well as mineralization of necrotic cells and tubular basement membranes in the kidney, have also been reported.⁶⁻⁸ These changes are similar to histopathologic changes caused by tartaric acid toxicosis reported in this case series, supporting tartaric acid as the proposed mechanism of grape and raisin toxicosis.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Patients are at high risk for severe and potentially fatal nephrotoxicosis after ingestion of cream of tartar, tamarind paste, or tamarind pods. Spontaneous vomiting can be expected 12 to 24 hours after ingestion, with azotemia developing within 24 to 48 hours.
- 2** Treatment for dogs with tartaric acid exposure should include prompt induction of emesis and aggressive IV fluid therapy.
- 3** Recognition of tartaric acid as a potential cause of nephrotoxicity due to grape and/or raisin ingestion may enable advancements in research, diagnosis, and treatment.

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Total & Ionized Hypercalcemia in Cats with Chronic Kidney Disease

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In the literature

van den Broek DHN, Geddes RF, Lötter NS, Chang Y-M, Elliott J, Jepson RE. Ionized hypercalcemia in cats with azotemic chronic kidney disease (2012-2018). *J Vet Intern Med.* 2022;36(4):1312-1321. doi:10.1111/jvim.16430

FROM THE PAGE ...

Reported prevalence of hypercalcemia in cats with chronic kidney disease (CKD) is highly variable; 13% to 76% of cats with azotemic (ie, International Renal Interest Society [IRIS] stage 2, 3, or 4) CKD have ionized hypercalcemia.^{1,2} Total calcium is poorly correlated with ionized calcium levels, particularly in patients with mild ionized hypercalcemia.^{3,4}



This study* evaluated ionized and total hypercalcemia in 164 cats with azotemic CKD. At diagnosis, 20% of cats had ionized hypercalcemia and 4% had total hypercalcemia. Ionized hypercalcemia subsequently developed in 42 out of 96 (44%) cats that were normocalcemic at the time of CKD diagnosis. In total, 45.7% of cats had ≥ 1 instance of hypercalcemia, with transient hypercalcemia noted in 16.7% of cats. Total hypercalcemia was identified in 32% of cats with persistent ionized hypercalcemia. Male cats and cats with higher potassium, higher total calcium, and lower parathyroid hormone concentrations were more likely to have ionized hypercalcemia.

IRIS stage was not associated with development of ionized hypercalcemia, and severity of ionized hypercalcemia in the study population was generally mild (median, 1.42 mmol/L), which may help exclude non-CKD causes (eg, malignancy) of ionized hypercalcemia in which moderate to marked hypercalcemia is more common.^{5,6} Parathyroid hormone concentrations did not have a predictable association with development or persistence of hypercalcemia, and feeding of a therapeutic renal diet did not impact development of ionized hypercalcemia.

Male cats and cats with higher potassium, higher total calcium, and lower parathyroid hormone concentrations were more likely to have ionized hypercalcemia.

*This study was funded by Royal Canin.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Ionized hypercalcemia related to CKD is often mild and can be transient; not all cats with CKD have persistent elevations.
- 2** Ionized calcium is considered the physiologically important form of calcium and should be measured in patients at risk for ionized hypercalcemia. Evaluation of total serum calcium alone underestimates ionized hypercalcemia, as total serum calcium is often within the reference interval in patients with mild ionized hypercalcemia.
- 3** Neoplasia, idiopathic hypercalcemia, CKD, and parathyroid-dependent hypercalcemia are the most common causes (in descending order) of ionized hypercalcemia in cats and are the primary differentials to consider in cats with total or ionized hypercalcemia.⁵

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Effect of Prazosin on Recurrent Urethral Obstruction in Cats

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In the literature

Conway DS, Rozanski EA, Wayne AS. Prazosin administration increases the rate of recurrent urethral obstruction in cats: 388 cases. *J Am Vet Med Assoc.* 2022;1-6. doi:10.2460/javma.21.10.0469

FROM THE PAGE ...

Feline recurrent urethral obstruction (rUO) affects 11% to 58% of cats.¹ Prazosin, an alpha-1-adrenoceptor antagonist, is commonly used to prevent rUO despite lack of supporting veterinary clinical studies.^{2,3} Prazosin has been recommended to reduce risk for recurrence because of its potential action as a urethral smooth muscle relaxant²; however, administration following urethral obstruction may cause increased patient stress from pill administration and adverse effects (eg, hypotension, lethargy, GI upset, ptialism).

The objective of this study was to determine whether prazosin administration decreased the rate of feline rUO both prior to and within 14 days of discharge. Observational surveys were completed by clinicians who self-reported that they always or never prescribe prazosin. Development of rUO was compared in 302 (78%) cats administered and 86 (22%) cats not administered prazosin. There was no significant association between prazosin administration and risk for rUO prior to discharge; however, within 14 days following discharge, the cumulative rate of reobstruction was significantly higher in cats treated with prazosin (73 [24%]) compared with cats not treated with prazosin (11 [13%]).

Data from this study combined with data from selected prior prospective studies showed that cats given prazosin (24%) were more likely to develop rUO than cats not given prazosin (13%).^{2,3} The only significant associations identified with

risk for rUO were subjective difficulty performing catheterization and perception of a gritty urethra during catheterization.

The cause of prazosin's lack of efficacy is likely multifactorial. The distal 63% to 72% of the feline urethra is composed of striated muscle, which is not relaxed by alpha-1-adrenoceptor blockade.⁴ Most urethral obstructions occur in the distal urethra where prazosin has no pharmacologic effect. Evidence that urethral spasms contribute to rUO in cats is lacking; treatment with urethral muscle relaxants may thus be ineffective.

The results of this study suggest that routine use of prazosin for prevention of rUO should be discouraged.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Prazosin is ineffective at decreasing risk for rUO and may increase risk for recurrence.
- 2** Prazosin may increase patient stress, increase treatment costs, and cause adverse effects.
- 3** Study results suggest prazosin should not routinely be administered to prevent rUO in cats.

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Cat Owners' Perception of Stress in the Clinic

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In the literature

Karn-Buehler J, Kuhne F. Perception of stress in cats by German cat owners and influencing factors regarding veterinary care. *J Feline Med Surg*. 2022;24(8):700-708. doi:10.1177/1098612X211041307

FROM THE PAGE ...

Stress in cats at the veterinary clinic typically occurs due to being away from the safety of the home and having no control over the environment or resources.¹ Cat owners can also be anxious or stressed during clinic visits.²



In this study, cat owners in Germany were surveyed about their relationship with their cat, identifying pet behavior, stress when visiting the clinic, and feline-friendly handling in the clinic. Of the 889 responses, 50.8% (419/824) reported experiencing negative emotions (eg, nervousness, anxiety) at the clinic and described visits as stressful; most respondents (88.7% [732/825]) felt the experience was stressful for their cat. In addition, owners who experienced stress were more likely to describe their cat as also being stressed.

Survey results showed many cats exhibited signs of frustration while in the carrier, including vocalization in >50%. Feline-friendly examination methods (eg, towel wrapping technique) were rarely used in the clinic; however, 89% (704/791) of owners considered their clinician to be feline friendly if they perceived few or no signs of stress or aggression from their cat toward the clinician. Owner satisfaction was generally high when the cat was perceived to be treated with patience and respect. Owner perception of their cat's stress during restraint by the scruff was also evaluated; cats were perceived to be significantly more fearful and stressed when this restraint technique was used.

Owner satisfaction was generally high when the cat was perceived to be treated with patience and respect.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** A quiet environment that fosters respectful relationships with owners should be implemented in the clinic.
The clinician should ask open questions, listen without interruption, maintain eye contact, and use welcoming body language to reinforce their interest in and empathy toward the owner's concerns.
- 2** The owner should understand the process of examination, with an explanation given beforehand if part of the examination or treatment could cause fear or anxiety. Feline-friendly handling techniques (eg, towel wrapping, soft bedding, gentle handling) and additional methods (eg, pheromone diffusers, avoiding encounters with dogs, allowing exploration of the examination room) taken to reduce patient stress in the environment should be explained to help reduce owner stress.
- 3** Staff members should be encouraged to pursue certification for feline-friendly practices and promote these skills on social media to show the clinic's commitment to patient comfort.
- 4** Transporting cats out of the home environment may exacerbate patient and owner stress, which can have significant negative consequences at the clinic. Owners should be educated about carrier techniques (eg, leaving a carrier open in the living space, inserting comfortable bedding, giving treats for entering the carrier) and which type of carrier is easiest to use.

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Suggested Reading

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Communicating Health Information to Pet Owners

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In the literature

Janke N, Coe JB, Bernardo TM, Dewey CE, Stone EA. Use of health parameter trends to communicate pet health information in companion animal practice: a mixed methods analysis. *Vet Rec.* 2022;190(7):e1378. doi:10.1002/vetr.1378

FROM THE PAGE ...

Monitoring trends in veterinary patient health parameters (eg, diagnostic test results, body weight) is typically encouraged^{1,2}; however, no studies have explored pet owner and clinician perceptions of using these trends or how they are used in conversations with owners.

This study aimed to assess owner and clinician perceptions on and use of health parameter trends during information exchange between owner and clinician. Characteristics (eg, visual aids) associated with discussions of health parameter trends were also examined.



Independent focus groups of pet owners and clinicians were conducted to assess perception of how health parameters trends are communicated, and examination room conversations were video recorded during 917 appointments. Transcripts of the recordings were evaluated using a validated content analysis method. Results showed owners prefer to receive a physical copy of test results rather than just hear them, be told actual values rather than that values fall within normal range, be shown trends in place of static values from the most recent visit, and have information presented both verbally and with visual aids (eg, color-coded graphs, charts).

In contrast to results from owner focus groups, some clinician respondents expressed belief that owners are indifferent about specific test values. Many clinicians indicated they only provide copies of test results when requested by the owner and do not present information via graphs or charts. In the transcripts, <10% of examinations included a discussion of health parameter trends, and only 9% of these discussions included a visual aid. Patient body weight was the most common health parameter trend shared by clinicians but typically only if the patient was overweight.

Clinicians cited a number of obstacles in sharing and discussing health parameter trends, including owner reactions (eg, overreaction to minimal changes), communication methods (eg, in person, phone, email), cost (eg, owner reluctance to repeat tests to evaluate trends), and time.

The authors identified opportunities to help incorporate owner desires with clinician communication, including use of integrated software that can create and distribute visual aids.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Owners may expect to receive more information about their pet's health parameters (eg, weight, diagnostic test results) than is typically given.
- 2** Owners prefer to receive test results in the form of trends (eg, presented via color-coded graphs, charts) rather than static numbers.
- 3** Lack of time and software that can generate graphs and charts with weight and diagnostic value trends may be the most significant barriers to delivering information. Existing resources, including the canine and feline AAHA life stage guidelines (see **Suggested Reading**) and canine evidence-based growth charts based on age and breed, can help meet owner communication expectations.³

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Suggested Reading

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Causes, Impacts, & Management of Client Incivility

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In the literature

Irwin A, Hall D, Ellis H. Ruminating on rudeness: exploring veterinarians' experiences of client incivility. *Vet Rec.* 2022;190(4):e1078. doi:10.1002/vetr.1078

FROM THE PAGE ...

Veterinary client incivility (ie, rudeness) can cause clinician stress and burnout.¹

This study analyzed interviews of 18 clinicians in the United Kingdom who described specific experiences of client incivility and their thoughts about potential consequences. Interview responses were assessed by psychology researchers with focus on perceived causes, potential impacts, and management of incivility.

Perceived causes of incivility were lack of respect, finances, and concerns about patient health. Potential impacts on clinicians included long-term mental health effects (eg, diminished self-confidence, withdrawal), career change, and desire to leave the veterinary profession. Incivility directly targeting the clinician or their clinical abilities was particularly impactful, as it affected the clinician's identity as a veterinary professional. Potential management included proactive client management (eg, using concise language to reduce the length of interaction), detailed discussion of concerns (eg, to prevent incivility motivated by worry), and issuing a verbal warning to unreasonable owners, as well as being empathetic, calm, and professional.

Reflection on potential causes of incivility and clinic policies, as well as a supportive clinic environment, helped clinicians manage negative interactions. Lack of support and time pressures had an adverse impact.

... TO YOUR PATIENTS

Key pearls to put into practice:

1 Considering the cause of incivility can help guide constructive responses, manage interactions, and minimize long-term personal impacts. Rudeness stemming from personality characteristics or a lack of respect may warrant establishment of firm boundaries (referred to as *drawing a line* in the study), whereas behaviors rooted in worry about the patient, financial concerns, or guilt warrant empathy, calmness, and professionalism. This author notes that prior trauma, pet loss, and negative veterinary experiences can also influence client behavior.

2 Clinics should encourage staff to discuss incidents to generate empathy and support from colleagues and consider implementing supportive protocols (eg, providing additional staff during certain appointments, allowing clinicians time to recover after an uncivil interaction).

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Types of Communication Problems in Veterinary Patient Care

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In the literature

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FROM THE PAGE ...

Poor communication can negatively impact the clinician-pet owner relationship and limit the effectiveness of the veterinary team, resulting in suboptimal patient care, treatment mistakes, and procedural errors.^{1,2} Although there is a relationship between communication and case outcomes, research on the impact of problematic communication on errors in veterinary medicine is limited.³

This primarily qualitative study explored the type and frequency of communication problems in 100 cases of alleged veterinary professional negligence involving canine patients. Problematic communication was identified in 80 cases. In 57 cases, communication breakdowns resulted in treatment errors, harm, potential for harm, delayed treatment, or death.

In the 80 cases categorized as having problematic communication, 170 individual problems were identified, with more than one problem identified in 48 cases. Of the 170 problems, 84 occurred during direct communication with a pet owner, 72 stemmed from intraprofessional communication within a team, and 14 occurred between clinics or with other organizations (eg, referral centers, laboratories).

Five themes of problematic communication emerged: content, context, channel,

systems, and perspectives. Problems with content occurred when disseminated information was incorrect, insufficient, or omitted. Context (eg, conversations in open, loud, busy rooms) and channel of communication (eg, phone vs in-person communication of time-sensitive or difficult information) also affected information delivery. Systems (eg, clinic culture, work processes, staffing issues) impacted ability to engage in honest conversations with pet owners and colleagues about medical errors. Failure to acknowledge differences between clinician and pet owner perspectives led to owners feeling unheard.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** Pet owners should be given undivided attention, and conversations should be conducted in a quiet, private setting free from interruptions and distractions. Owner views, thoughts, beliefs, and opinions should be elicited and reiterated to ensure they feel heard and valued.
- 2** Implementing a system for case transfers between clinicians can reduce the risk for medical errors.²
- 3** Pet owners and clinic staff should be invited to engage in the decision-making process, and their unique perspectives and experiences should be acknowledged.

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