Using Artificial Intelligence to Predict Risk for Chronic Kidney Disease

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In the literature

Biourge V, Delmotte S, Feugier A, Bradley R, McAllister M, Elliott J. An artificial neural network-based model to predict chronic kidney disease in aged cats. *J Vet Intern Med*. 2020;34(5):1920-1931.

FROM THE PAGE …

Early detection of feline chronic kidney disease (CKD) can be challenging, as even the most reliable markers of kidney dysfunction can be influenced by extrarenal factors. Patient history, physical examination, and laboratory diagnostics (eg, BUN, creatinine, urine specific gravity [USG], packed cell volume, electrolytes) are typically used to determine whether kidneys are functioning properly, but evaluation of laboratory results only provides (at best) an indication of kidney dysfunction at 75% nephron loss.[1] Newer diagnostics to determine risk factors or biological markers for renal dysfunction are therefore of utmost importance.

This study* used machine learning to attempt to predict whether enrolled cats would develop CKD within 12 months. The model recognized subtle combinations of laboratory tests (eg, BUN, creatinine, USG) that serve as early markers of CKD risk in cats ≥7 years of age. Two strategies to determine a cutoff between cats with high and low risk for developing CKD were considered. The first strategy maximized both sensitivity (87%) and specificity (70%) and appeared most

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appropriate for scenarios in which correctly identifying cats that will not develop CKD within 12 months is considered more important than correctly identifying cats that will develop CKD (ie, high negative predictive value). The second strategy maximized specificity (98%) but had lower sensitivity (42%). Because this strategy has a higher positive predictive value (87%), it is more appropriate for attempting to limit false-positive results. Clinicians should be aware of the sensitivity and specificity of the exact strategy being used when applying it to clinical practice.

… TO YOUR PATIENTS

Key pearls to put into practice:

1 The model in this study may help predict the risk for developing CKD within 12 months in cats ≥7 years of age but should not be applied to cats <7 years of age.

2 Although the model in this study does not provide a diagnosis of CKD, it is important to increase monitoring of laboratory tests (specifically BUN, creatinine, USG, electrolytes, and blood pressure) to every 3 to 4 months in cats considered at risk based on this model.

3 This study only looked at laboratory results from the patient's most recent visit. Careful review of patient history—especially as it pertains to trends in BUN, creatinine, USG, body weight, and clinical signs—may provide more information.

Reference

1. Polzin DJ. Chronic kidney disease. In: Ettinger SJ, Feldman EC, Côté E, eds. *Textbook of Veterinary Internal Medicine*. 8th ed. Elsevier; 2017:1938-1958.

Suggested Reading

Bradley R, Tagkopoulos I, Kim M, et al. Predicting early risk of chronic kidney disease in cats using routine clinical laboratory tests and machine learning. *J Vet Intern Med*. 2019;33(6):2644-2656.