Veterinary Oncology

EDITORIAL Open Access

The future is here: an introduction to the *Veterinary Oncology* collection on Artificial Intelligence and Informatics

Christopher J. Pinard[1,2,3*]

Introduction

Veterinary medicine has long been defined by its commitment to advancing animal health and enhancing quality of life while tackling complex diseases. In recent decades, rapid technological progress has revolutionized diagnostic and therapeutic strategies. Today, we stand at the threshold of an era in which data science and artificial intelligence (AI) are being seamlessly integrated into veterinary clinical practice. This collection arrives at a time when vast clinical datasets, cost-effective computational resources, and multidisciplinary collaborations are converging to power AI-driven innovations in veterinary oncology. Whether it is through the automated analysis of medical images or the integration of multi-omics data for personalized treatment planning, AI holds the promise of redefining diagnostic precision and therapeutic outcomes across our field [1, 2].

Bridging veterinary and human oncology through AI

The substantial achievements in human healthcare AI provide a robust template for veterinary applications. In human oncology, deep learning algorithms have transformed diagnostics; for example, radiomics-based approaches have proven effective in predicting cancer outcomes for women with breast cancer, and have been implemented across multiple health systems [3–5]. These successes have spurred efforts to adapt similar methodologies to veterinary oncology, illustrating that techniques originally developed for human patients can be tailored to solve veterinary-specific challenges, but may also be translated back to the human space [6, 7]. Bertram and colleagues highlighted a comparative approach to breast cancer mitotic count detection, showing an excellent cross-collaborative ability when the model was trained on a canine dataset [8]. In osteosarcoma, given the higher incidence of the disease (and therefore data), a canine histopathology dataset was successfully used to train a model through adversarial learning to detect histologic subsets of osteosarcoma in humans [9]. With validated execution and a collective domain approach, comparative artificial intelligence has large implications in advancing human healthcare, in addition to veterinary healthcare. Such cross-pollination exemplifies the growing synergy between human and veterinary medical research, ultimately enhancing translational and comparative oncology.

Recent AI advances in veterinary oncology

Recent studies in veterinary oncology have showcased the transformative impact of AI across multiple diagnostic modalities. Reviews on model development and quality assurance have been published elsewhere [10, 11]. In addition, dedicated work on natural language processing—for example, the evaluation of an open-source

*Correspondence:
Christopher J. Pinard
pinardc@uoguelph.ca
[1] Department of Clinical Studies, Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada
[2] ANI.ML Research, ANI.ML Health Inc., Toronto, Ontario, Canada
[3] The Centre for Advancing Responsible and Ethical Artificial Intelligence (CARE-AI), University of Guelph, Guelph, Ontario, Canada

Named Entity Recognizer (NER) to extract critical information from unstructured veterinary medical records—has demonstrated the potential to streamline data curation but also showcased the need for domain specific tools and some limitations of the capabilities of comparative systems without rigorous oversight [12]. In the realm of histopathology and imaging, several studies highlight the current progress in computer-aided diagnosis. This includes automated diagnosis of canine skin tumors, computer vision models for the detection of pododermatitis that could be used for neoplastic skin conditions, as well as computer vision systems to pre-predict histology (including brain tumours and splenic tumours) [13–17]. Techniques designed to improve reproducibility, such as computer-assisted mitotic counting and algorithms for identifying the most mitotically active tumor regions, have further underscored the potential of AI [13, 18, 19]. Complementing these advances, the release of curated datasets like the CATCH dataset is helping to standardize research and accelerate development in veterinary oncology [20].

Regulatory and ethical considerations

As AI becomes fully integrated into clinical workflows, addressing ethical and regulatory challenges is paramount. In human healthcare, issues such as data privacy, algorithmic transparency, and inherent bias have spurred the development of rigorous regulatory frameworks [21–23]. In veterinary medicine, Duggirala et al. have offered a regulatory perspective that outlines current initiatives and future prospects for AI deployment [21]. Moreover, reviews of veterinary diagnostic imaging emphasize the need for clear guidelines and safe-deployment toolboxes to ensure AI systems are both effective and ethically sound [21–23]. To date, there are limited to no formal guidelines followed by veterinary teams for the safe and adequate deployment of AI in hospital systems. These initiatives are required and will form the foundation for tailored regulatory frameworks that safeguard patient welfare and promote responsible innovation.

Conclusion

The research showcased in this collection of BMC *Veterinary Oncology* will capture a pivotal moment in which AI and data science are converging to transform veterinary oncology. Advances in computer-aided diagnostics, integrated multi-omics, specialized NLP tools, and cross-disciplinary comparative studies underscore the power of AI to bridge human and veterinary medicine. As we move forward, the development of robust ethical guidelines and regulatory standards will be essential to ensure that these technologies are deployed safely and equitably. Ongoing collaboration among clinicians, researchers, and regulatory bodies will be critical for harnessing the full potential of AI in advancing veterinary oncology and fostering innovation across disciplines.

We invite you to engage with the pioneering work presented in this issue—a significant step toward a future where AI is an indispensable tool in transforming veterinary practice and unlocking new opportunities in comparative oncology.

Author's contributions

C.J.P is the sole author of this editorial.

Declarations

Competing interests

C.J.P is the Guest Editor of the collection Artificial Intelligence and Informatics in *Veterinary Oncology*.

Published online: 07 May 2025

References

1. Akinsulie OC, Idris I, Aliyu VA, Shahzad S, Banwo OG, Ogunleye SC, et al. The potential application of artificial intelligence in veterinary clinical practice and biomedical research. Front Vet Sci. 2024;11:1347550.
2. Appleby RB, Basran PS. Artificial intelligence in veterinary medicine. J Am Vet Med Assoc. 2022;260(8):819–824.
3. McKinney SM, Sieniek M, Godbole V, Godwin J, Antropova N, Ashrafian H, et al. International evaluation of an AI system for breast cancer screening. Nature. 2020;577:89–94.
4. Tran WT, Sadeghi-Naini A, Lu FI, Gandhi S, Meti N, Brackstone M, et al. Computational radiology in breast cancer screening and diagnosis using artificial intelligence. Can Assoc Radiol J. 2021;72:98–108.
5. Arasu VA, Habel LA, Achacoso NS, Buist DSM, Cord JB, Esserman LJ, et al. Comparison of mammography AI algorithms with a clinical risk model for 5-year breast cancer risk prediction: an observational study. Radiology. 2023;307:e222733.
6. Lungren MP, Wilson DU. Artificial intelligence in veterinary care will be a major driving force behind AI advancements in healthcare. Vet Radiol Ultrasoun. 2022;63:913–5.
7. Hennessey E, DiFazio M, Hennessey R, Cassel N. Artificial intelligence in veterinary diagnostic imaging: a literature review. Vet Radiol Ultrasoun. 2022;63:851–70.
8. Aubreville M, Bertram CA, Donovan TA, Marzahl C, Maier A, Klopfleisch R. A completely annotated whole slide image dataset of canine breast cancer to aid human breast cancer research. Sci Data. 2020;7:417.
9. Patkar S, Beck J, Harmon S, Mazcko C, Turkbey B, Choyke P, et al. Deep domain adversarial learning for species-agnostic classification of histologic subtypes of osteosarcoma. Am J Pathol. 2023;193:60–72.
10. Pacholec C, Flatland B, Xie H, Zimmerman K. Harnessing artificial intelligence for enhanced veterinary diagnostics: a look to quality assurance, Part I model development. Vet Clin Pathol. 2024. https://doi.org/10.1111/vcp.13401.
11. Pacholec C, Flatland B, Xie H, Zimmerman K. Harnessing artificial intelligence for enhanced veterinary diagnostics: a look to quality assurance, Part II external validation. Vet Clin Pathol. 2025. https://doi.org/10.1111/vcp.13407.
12. Pinard CJ, Poon AC, Lagree A, Wu K, Li J, Tran WT. Precision in parsing: evaluation of an open-source Named Entity Recognizer (NER) in veterinary oncology. Vet Comp Oncol. 2024. https://doi.org/10.1111/vco.13035.
13. Glahn I, Haghofer A, Donovan TA, Degasperi B, Bartel A, Kreilmeier-Berger T, et al. Automated nuclear morphometry: a deep learning approach for prognostication in canine pulmonary carcinoma to enhance reproducibility. Vet Sci. 2024;11:278.

14. Fragoso-Garcia M, Wilm F, Bertram CA, Merz S, Schmidt A, Donovan T, et al. Automated diagnosis of 7 canine skin tumors using machine learning on H&E-stained whole slide images. Vet Pathol. 2023;60:865–75.
15. Smith A, Carroll PW, Aravamuthan S, Walleser E, Lin H, Anklam K, et al. Computer vision model for the detection of canine pododermatitis and neoplasia of the paw. Vet Dermatol. 2024;35:138–47.
16. Burti S, Zotti A, Bonsembiante F, Contiero B, Banzato T. A machine learning-based approach for classification of focal splenic lesions based on their CT features. Front Vet Sci. 2022;9:872618.
17. Barge P, Oevermann A, Maiolini A, Durand A. Machine learning predicts histologic type and grade of canine gliomas based on MRI texture analysis. Vet Radiol Ultrasound. 2023;64:724–32.
18. Aubreville M, Bertram CA, Marzahl C, Gurtner C, Dettwiler M, Schmidt A, et al. Deep learning algorithms out-perform veterinary pathologists in detecting the mitotically most active tumor region. Sci Rep-UK. 2020;10:16447.
19. Bertram CA, Aubreville M, Donovan TA, Bartel A, Wilm F, Marzahl C, et al. Computer-assisted mitotic count using a deep learning–based algorithm improves interobserver reproducibility and accuracy. Vet Pathol. 2022;59:211–26.
20. Wilm F, Fragoso M, Marzahl C, Qiu J, Puget C, Diehl L, et al. Pan-tumor CAnine cuTaneous Cancer Histology (CATCH) dataset. Sci Data. 2022;9:588.
21. Duggirala HJ, Johnson JL, Tadesse DA, Hsu CH, Norris AL, Faust J, et al. Artificial intelligence and machine learning in veterinary medicine: a regulatory perspective on current initiatives and future prospects. Am J Vet Res. 2025;86:S16-21.
22. Rajpurkar P, Chen E, Banerjee O, Topol EJ. AI in health and medicine. Nat Med. 2022;28:31–8.
23. Gichoya JW, Banerjee I, Bhimireddy AR, Burns JL, Celi LA, Chen LC, et al. AI recognition of patient race in medical imaging: a modelling study. Lancet Digit Health. 2022;4:e406-14.

Publisher's Note