Ethical Considerations for Artificial Intelligence Tools in Small Animal Veterinary Medicine

Simon Coghlan, BVSc, PhD[a,*], Thomas Quinn, MD, PhD[b]

KEYWORDS

• Animal welfare • Artificial intelligence • Ethics • Health • Small animals
• Veterinary medicine

KEY POINTS

- Artificial intelligence (AI) tools are growing in small animal veterinary medicine but need to be used ethically to promote animal health and welfare.
- Practitioner use of AI tools should be guided by patient-centered ethics principles of non-maleficence and beneficence.
- The ethics of veterinary AI tools are affected by "machine" and "human" factors.
- AI developers and purveyors, hospital and clinic managers, and veterinary bodies have accountability responsibilities to assist practitioners in performing their ethical roles.

INTRODUCTION

This article examines ethical aspects of the growing development and use of artificial intelligence (AI) systems and tools in small animal veterinary medicine.[1,2] Such technologies will likely be used most often with cats and dogs, but can also be used with other small companion animal species such as rabbits and hamsters. AI tools are also being developed for animals that are not companions, such as animals in farming.[3] These other contexts raise some different ethical considerations.[4] Large animals, most notably horses, are sometimes kept for companionship rather than for their monetary value. The ethical issues for these animals are similar to those for smaller animal companions.

The focus of this article is AI tools that are directly related to the clinical care of companion animals, rather than AI used for other purposes like hospital administration

[a] School of Computing and Information Systems, Centre for AI and Digital Ethics, The University of Melbourne, Grattan Street, Parkville, Melbourne, Victoria 3010, Australia; [b] Geelong, Victoria, Australia
* Corresponding author.
E-mail address: simon.coghlan@unimelb.edu.au

Vet Clin Small Anim 56 (2026) 1039–1052
https://doi.org/10.1016/j.cvsm.2026.03.001 **vetsmall.theclinics.com**
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Abbreviations	
AI	artificial intelligence
FDA	Food and Drug Administration
LLM	Large language model

(eg, automated appointment reminders), medical teaching, and veterinary biomedical research.[5,6] The aim is to provide a helpful overview and analysis of ethical considerations for clinical veterinary AI in small animal practice.

AI has not yet transformed veterinary medicine but may do so in time as tools improve and are adopted.[7] This has begun to happen in human medicine.[8,9] Examples of AI in human medicine include tools for radiological interpretation, patient monitoring, early disease prediction, genomics, surgery, and mental health care.[8,10,11] Although human medicine has greater resources, veterinary medicine is likely to progressively adopt some similar AI tools. Even now there are veterinary AI tools on the market, and many others are being researched and developed.

As in human medical practice, an already popular tool in veterinary medical practice is AI scribes that listen to consultations and automatically write patient records. AI is also used to generate medical instructions for clients. Another promising tool is computer vision that analyses radiographic, computed tomography (CT), MRI, and ultrasound images to provide image segmentation, highlight areas of interest, and even propose diagnoses.[12,13] AI may also be used in radiation oncology.[14] Some veterinary AI devices analyze pathology data from blood, urine, and tissue aspirates.[15]

AI is being developed to detect early disease, assess welfare states, assist in diagnoses, and even to provide treatment recommendations for medical conditions, from hyperadrenocorticism to neurologic disease and heart abnormalities.[16] Such AI tools may make inferences based on a single data type or combined sources like medical histories and tests. Large language models (LLMs), both general purpose models and bespoke veterinary versions,[17] can triage patients with various symptoms and offer health advice as chatbots to veterinarians or direct to clients. Time may see more AI embedded in surgical robots and ambient or wearable sensors for animal health monitoring in and beyond hospitals and clinics.[18] Furthermore, it is possible that emerging agentic AI may be used to increasingly automate parts of veterinary as well as human medicine.[8]

Veterinary AI presents both significant promise and salient challenges,[19,20] including possible risks to patient health and welfare. To examine this ethical terrain, this article first introduces relevant ideas from veterinary ethics. It then explores “machine” and “human” ethical issues and finishes by considering accountability for veterinary AI products.

VETERINARY ETHICS

Ethical examination of veterinary AI requires some understanding of veterinary ethics[21] and the moral duties and role of practitioners. The practitioner’s *legal* obligations to abide by animal welfare laws and professional regulations are the bare minimum of their ethical responsibilities, which are in any case too complex for laws to wholly regulate. Upon graduating, veterinarians may take an oath expressing fundamental duties toward patients, clients, profession, and society.[22] Some oaths insist that duties to *animal* health and welfare is the veterinarian’s foremost responsibility.[23]

Some ethicists have invoked obligations of nonmaleficence (avoiding causing harm) and beneficence (improving welfare) toward animal patients[24,25]—analogous to

doctors' obligations to human patients.[26] Because sentient animals can have positive and negative mental states, many scholars believe they have various morally relevant *welfare* interests such as avoiding suffering, having desired experiences, and not dying prematurely.[27,28] Philosophers argue that animals have intrinsic moral status or standing.[29] The fact that sentient animals have a welfare and moral standing helps underpin the more specific veterinary duties of beneficence and nonmaleficence.

Saving lives, promoting animal well-being, and reducing suffering are main reasons many veterinarians enter practice.[30] While veterinarians must sometimes cause harm to animals from painful or distressing procedures, the justifying goal in these actions is to provide overall benefit to those patients. Together, the patient-centered-principles of beneficence and nonmaleficence are aimed at helping animals to have good lives.

Ethicists also recognize some duties regarding human clients in small animal practice. Many clients have interests in being involved in veterinary decisions that affect their nonhuman companions or family members.[31] Clients also often have the best understanding of an animal's personality and preferences (although of course some clients may treat their animals more instrumentally). Furthermore, client permission and cooperation is required for veterinarians to successfully treat animal patients.[23]

Duties to patients are complicated by the decisions, resources, and capabilities of clients who legally own the animals.[32,33] Oftentimes, the interests and aims of practitioner, client, and patient are happily aligned.[34] Yet significant ethical challenges arise when the client refuses or is unable (eg, for financial reasons) to follow good medical advice or when they request harmful interventions.

Veterinary ethicists have argued that in such cases of conflict or misalignment practitioners should act as *advocates* for the animals under their care.[35] This may require refusing to act on client requests for ineffective or harmful interventions, persuading clients to accept important medical treatment, or offering suboptimal but still beneficial options when the client has financial or capability limitations.[36] Abiding by patient-oriented principles of beneficence and nonmaleficence can require carefully and contextually balancing benefit and harm for animals in medical decision making. The use of veterinary AI must similarly accord with this ethical aim.

There is a case for saying that both hospital managers and AI designers and purveyors should understand and support these defining ethical responsibilities for veterinarians. AI ethicists have also argued that makers and distributors of AI products have independent duties to ensure their systems avoid harming and/or provide benefit for animals.[4,37] That duty plausibly applies still more forcefully for AI systems, including bespoke veterinary AI tools, that are expressly designed to benefit animals.[38]

MACHINE ISSUES

Several ethical issues are closely connected to the nature and development of AI tools themselves. AI performs tasks normally requiring human (or animal) intelligence, including perceiving, classifying, inferring, predicting, and deciding. This allows AI to undertake medical activities such as analyzing radiographs and offering diagnoses and treatment options.

Encouragingly, research is showing that such systems can sometimes match or outperform general practitioners and even specialists.[39,40] In addition, AI can act rapidly and without tiredness, distraction, and human emotional bias. Veterinary AI use may therefore sometimes accord with the patient-oriented principles of nonmaleficence and beneficence.

However, AI can also pose risks to patient wellbeing[41] (**Table 1**). For instance, AI systems can be inaccurate and give misdiagnoses and false positive and negative

Table 1
Summary of machine-related and human-related ethical challenges for artificial intelligence tools with explanations or examples

	Explanations and Examples
Machine Issues	
Accuracy	AI outputs can range from delivering above-human accuracy to issuing misdiagnoses, false positives, and false negatives
Bias	Poorer AI performance can occur for certain conditions, species, breeds, etc.
Opacity	Uninterpretable outputs can raise risks and reduce practitioner trust
Data security	Client and patient data are confidential and require informed consent for capture and re-use in AI systems
Human issues	
Practitioner overtrust	Automation bias, unthinking or habitual deferral to AI, and failure to fully consider individual patient needs can occur when relying on machine outputs
Deskilling	Gradual erosion of knowledge and skills due might occur from reduced opportunities for thoughtful decision- making and practice
Cognitive load	Learning about AI tools and interpreting numerous outputs could increase pressure on practitioners and lower their performance
Misuse and abuse	Adoption of an untrustworthy AI tool or failure to consider other evidence that is material to diagnosis or treatment can damage patient care
Client attitudes	Some clients may distrust or overestimate AI systems and require education, counseling, and provision of alternative beneficial options

predictions about various disease conditions or about pain and other affective states.[6,42] LLMs can provide incorrect and hallucinated recommendations about diseases, pharmacologic agents, and therapies.[8] Such inaccurate outputs can be caused by insufficient training data and by the nature of the AI training methods. The result of deploying these systems may be harm to animal health and welfare.

In addition, machine learning systems be *biased*. AI in human medicine has notoriously produced harmful medical recommendations for people with protected attributes like disability and race.[43] Another example is AI scribes that perform comparatively poorly for certain racial or other demographic groups due, for example, to accent differences.[44] A common cause of AI bias is insufficient or misleading training data. In the veterinary context, bias can result in erroneous outputs for certain species, breeds, rare conditions, or unusual presentations.[6]

Another problem arises when a machine learning system that performs well in one context is used in another context for which it has not been sufficiently trained, again potentially leading to inaccurate and biased outputs and consequent harm. Importantly, there is a relative lack of quality training data for veterinary applications.[45] Compared to human medical records, animal medical records are less widely available for model training, making it potentially harder to create relatively accurate and unbiased tools in the veterinary context.

Consequences of AI error for animal health and welfare range from minor to grave, and can include suffering, disability, distress, and death. Animals in veterinary

medicine are commonly euthanized, both when they are terminally ill and when they have treatable conditions. The ready availability of euthanasia for animals, plus a lack of strong legal protection of nonhuman lives and the financial expense of unsubsidized veterinary medicine, put patients at particular risk of such harm from inaccurate AI tools.

A related concern is that deep learning methods in AI systems can be *opaque* or noninterpretable.[46] The outputs of deep neural networks—which may be used in AI scribing, radiological interpretation, pathology analysis, triaging, and so on—are based on enormously complicated patterns which defy human understanding. This means that if, for example, a deep learning system indicates canine lymphoma, the human operator may not know the precise grounds of that diagnosis.

Some scholars argue that AI opacity is unproblematic if the model is judged by other methods, such as rigorous longitudinal studies of performance, to be accurate and reliable.[47] However, such studies may be unavailable, especially for relatively new AI products. And while interpretability is not a necessary condition for accuracy, understanding how a model generates outputs can be crucial for validation and trust that the AI can perform at a satisfactory level. Furthermore, some AI systems adapt or change over time, making their accuracy harder to track.

Even highly impressive AI systems can make major (if occasional) errors no trained human would make—such as when they hallucinate content or use data that is not reliably (eg, causally) connected to accurate outputs. An example of the latter is AI that tracks radiographic artifacts or the arbitrary positioning or preprocessing of radiographs rather than meaningful anatomic features in radiographic images.[45] For instance, one AI model misdiagnosed pneumonia in a human patient due to noise in training images.[48]

A way to avoid the problem of opacity is to instead design interpretable AI systems for medical applications.[46] Alternatively, if deep learning AI tools are used, it may be necessary to find adequate explainability methods for understanding their outputs[49] so that practitioners can have confidence in them.[50]

Given these ongoing concerns about trustworthiness, it is vital that practitioners carefully assess their adoption of AI tools against the basic ethical duties of nonmaleficence and beneficence toward patients. Recalling such principles helps practitioners to weigh the pros and cons of deploying particular AI products on patients.

A final concern is the *privacy and security* of data used to train models or fed into operating AI systems. Mostly this raises privacy worries for human clients,[51] although it is possible that information about animals may be used by nefarious actors to harm them (eg, in domestic violence situations).[4] Private digital information can be leaked, re-used, sold, and subject to cyberhacking.[52]

Duties to protect veterinary clients may require that practitioners try where possible to ensure that client data is kept private (eg, anonymized and encrypted). This may be easiest for systems designed by groups like veterinarians or academics that have less monetary interest in the technology. It can be more difficult for practitioners to know what a private company does with confidential data given the possible financial benefits of data collection and use (eg, selling data or using data to train models). At minimum, practitioners should disclose these facts to their clients and seek their permission before facilitating the collection of confidential information[6] (see **Table 1**).

HUMAN ISSUES

From an ethical perspective, AI tools should be considered not only as technical objects but also as components of sociotechnical systems. Certain ethical implications

of AI for veterinary medicine arise from how human beings perceive and interact with the technology.

As observed, AI tools matching or exceeding human expert ability could bring substantial benefits for animal health and welfare. Such tools could assist humans with important cognitive tasks such as triaging, providing second opinions, and offering medical suggestions. AI tools could potentially accelerate work and free up practitioners to focus on activities like client discussion and hands-on patient care.

If advanced, trustworthy medical AI tools become relatively cheap and available, they might assist clients and practitioners in remote locations where veterinary care, second opinions, or specialist assistance are in short supply. It should be noted, however, that expensive AI could disadvantage clients and patients with limited means or from poorer areas.

Veterinary AI raises various ethical challenges from a human and a user perspective (see **Table 1**). While these "human" issues sometimes interact with "machine issues" such as accuracy, bias, and opacity, they are also strongly influenced by how people *respond* to AI tools. The remainder of this section examines these human-related challenges.

One problem concerns practitioners *overtrusting* AI outputs. In an example of *automation bias*, humans may overtrust seemingly adept AI systems when they should be more cautious.[53] Even AI that performs at a specialist medical level may require critically reflective human supervision, since its outputs may be wrong or misleading, or require careful interpretation. Here, a problem might arise for nonspecialist practitioners lacking the ability to adequately scrutinize specialist level AI recommendations.

Another potential risk which could arise over the longer term is *deskilling*. A tendency to frequently defer to AI machines could conceivably erode certain cognitive and perhaps practical medical skills. While it is possible that AI tools which offer sound advice and give good medical reasons for predictions and inferences will promote *up*skilling—with consequent benefits for patients—practitioner deskilling cannot be ruled out.[54]

As AI becomes more prevalent, abundant medical AI outputs may also paradoxically land practitioners with extra *cognitive load*. Having to learn the basic mechanisms[55] and pros and cons of AI is yet another possible cognitive imposition for veterinarians, many of whom already face overwork and burnout.[56]

A possibility also exists for *misuse and abuse* of medical AI. Some AI tools will be untrustworthy despite surrounding enthusiasm and effective marketing. Adoption of inferior and unreliable AI products would constitute an abuse of the technology. Misuse of AI could play out in various ways. For example, the temptation to deploy AI may result in overdiagnosis of benign conditions[57] and excessive testing and treatment nonbeneficial or harmful to animals.

Misuse could also occur when AI outputs are not considered in the wider clinical context. Practitioners will need to take into account the overall patient picture when integrating AI-based outputs into their decision making. A sound diagnosis can depend on a range of evidence above and beyond machine predictions, even when the predictions are reasonable based on the information on which the AI tool generated its outputs.

AI-based recommendations for interventions and treatments must also be considered alongside the patient's individual situation. Suppose an AI tool makes the reasonable suggestion that a patient with condition X should receive treatment Y—Y being "gold standard" treatment for X. While this may in general be good advice, it may not be best for the particular patient.

For instance, the individual patient may be too anxious, frail, or comorbid to benefit from interventions that benefit many other patients with the same condition. Conversely, the patient might be robust and easy-going enough to receive treatment too burdensome for many others. Practitioners must therefore not only exercise medical expertise, but also carefully apply principles of nonmaleficence and beneficence for *each individual patient* when deciding when and whether to follow AI-suggested interventions.[58] This would be particularly important if an AI tool were to recommend so grave an intervention as euthanasia.

Finally, the *attitudes of clients* may influence AI use, for better or worse. Currently, AI technologies in general are provoking both enthusiasm and public concern.[59] Clients might sometimes inappropriately resist or push for AI use. Practitioners will need to adequately inform and counsel clients about the risks and benefits of the AI tool. For AI tools that pose nontrivial risks to a patient's well-being or to client confidentiality, the ideal procedure would be to inform and seek permission from each client at the point of care.[60]

ACCOUNTABILITY ISSUES

The risks and benefits of AI for small animal patients raise questions of *accountability* for decision makers. To ensure ethically desirable outcomes, it is important that decision makers understand their specific responsibilities and that appropriate mechanisms are enacted to protect and assist patients (and clients).

As suggested, practitioners have duties of beneficence and nonmaleficence toward their patients. It was also suggested that certain associated parties, such as AI developers and hospital managers, could be rightly expected to support or not undermine them in this ethically important role, and that such parties may also have some independent duties to protect animal welfare. With that in mind, consideration can now be given to accountability issues for AI developers, veterinary practitioners, hospital managers, and veterinary bodies. For convenience, the discussion is summarized in **Table 2**.

Table 2
Examples of accountability responsibilities and measures for various decision makers

Decision-Maker	Examples of Accountability
AI developers and purveyors	• Ensure AI tools have sufficient accuracy and minimal bias • Consult with veterinary domain experts and practitioners • Test and monitor outputs and outcomes of AI tools • Transparently demonstrate pros and cons of AI products • Create natural interfaces that minimize user error
Veterinary practitioners	• Understand possible harms and benefits to patients of AI tools • Critically review all AI outputs before acting • Consider AI outputs in overall context of the patient's need • Counsel clients on AI tool use in specific contexts • Gain clients' informed permission when appropriate
Hospital and clinic managers	• Explore risks and benefits of AI tools before adoption • Allow practitioners the freedom to decide on AI uses • Evaluate effects on clinical workflow, workload, client finances, privacy, and environment
Veterinary boards and associations	• Advise profession on the ethical and legal use of AI tools • Encourage collaborations to assess value of veterinary AI • Advise on education for students and practicing veterinarians

Artificial Intelligence Developers and Purveyors

Since veterinary practitioners and veterinary hospitals should only adopt clinical and surgical technologies that benefit and minimize harm to patients, they will rightly expect that AI designers and purveyors of veterinary AI tools ensure these offerings can help meet rather than thwart this primary ethical goal. Developers must therefore create sufficiently accurate and unbiased AI products—especially when opaque deep learning methods are used.

However, it should be noted that there is minimal or no regulation for veterinary devices, unlike devices in human medicine.[61] For example, the US Food and Drug Administration (FDA) regulates human medical devices with a risk-based system that requires safety review before approval and ongoing monitoring following clinical use. The FDA does not regulate any devices for animal use. A similar relative lack of regulation of devices in veterinary medicine occurs in other jurisdictions.

Key steps developers may take to create more trustworthy tools could include ensuring direct domain expert involvement (eg, with academics and practicing veterinarians) in AI design,[8] and undertaking representative and adequate data collection and preparation.[62] Developers could also consider or ensure proper testing and validation of AI models in laboratories and sandboxes, the use of techniques like prompt engineering to improve outputs in relevant AI models, the production of peer reviewed studies of AI device performance, third-party independent audits, and the rigorous ongoing monitoring of AI tools and their outcomes for patients in practice.

The veterinary profession should also expect that AI developers sufficiently *demonstrate* the trustworthiness of their products. This would entail AI makers, companies, and spokespeople issuing accurate, honest, transparent, and well-substantiated claims about their tools. Relevant information could well encompass the AI tool's development, performance, and efficacy, and its strengths, indications, and limitations. Such information should also be easy for practitioners or veterinary hospitals to access and understand (eg, omit unnecessary jargon). Finally, it is reasonable to expect that the *interfaces* of AI tools are clear, useable, and understandable, to minimize operator error.

Veterinary Practitioners

Duties to advance the health and welfare of their patients mean that practitioners must exercise careful judgment in AI tool adoption and employment. Although this requirement applies to any other device or decision in clinical practice, AI is a distinctive technology with peculiar promises and dangers that must be understood. Practitioners should be wary of inflated claims about AI—a general phenomenon which has also manifested with medical AI[63] and animal-related AI.[4]

Apart from a baseline understanding of AI,[55] practitioners should also be aware of relevant facts about *specific* AI tools: their accuracy, bias, test results, data representativeness, and so on. As with other veterinary technologies, practitioners must exercise professional skill in deciding when an AI tool should and should not be used for an individual patient with their own particular needs.

It has been cogently argued that medical AI tools should be decision support tools that augment rather than replace human expertise.[13,45] A practitioner therefore must not simply accept an AI-based diagnosis, treatment recommendation, or medical plan as infallible. They should holistically consider other relevant medical knowledge and information about the patient. Clearly, they should also document their use of AI tools in patient medical records where this is material to their decision making. For example, if a practitioner partly relies on an output from AI-based radiology interpretation or

from an LLM decision support tool, these outputs (and where relevant the prompts) should be recorded.

At this stage, it may be unwise even to use AI to automate restricted *parts* of the clinical process. Technologies may sometimes reasonably automate certain activities—such as when automated clinical laboratory analyzers are used for routine biochemical and hematologic testing[64]—when such usage is consistent with good medical practice. Yet emerging AI tools are still to attain a requisite level of trustworthiness in veterinary medicine.

Consequently, the outputs of clinically significant AI—whether from scribes, image analyzers, or LLM chatbots—ought always to be critically reviewed and interpreted by practitioners before being acted on.[65] Note also that veterinary regulators hold practitioners professionally responsible for their clinical decisions and activities including when using AI outputs.[66]

Insofar as practitioners should be advocates for their patients,[36] it may in time become appropriate to counsel clients to consent to the use of AI tools that are demonstrably important for the patient's health and welfare. At this stage, however, AI systems are not trusted enough to be *required* by the appropriate medical standards of the profession.

Indeed, practitioners may need to counsel clients against the use of AI tools when they are harmful or of no patient benefit, as they should with other harmful or nonbeneficial interventions.[67] This need for client education and counseling may extend not only to specific veterinary tools but also to AI systems that are available or marketed to the public, such as AI wearables and LLM chatbots.

Veterinary Managers

Managers and owners of hospitals and clinics often oversee the purchase and adoption of medical tools. These individuals, some of whom have veterinary medical qualifications, also have power and influence over how their veterinary staff practice medicine. It is possible that managers may, overtly or subtly, put pressure on employees to use expensive AI systems that require a return on investment.

As suggested, managers ought to act in ways that allow practitioners to uphold their fundamental ethical obligations as veterinarians. This would entail giving practitioners discretionary freedom to make good ethical and clinical judgments about the use or nonuse of AI tools, irrespective of conflicting business interests.

Hospital managers may also be expected to help ensure that patient and client data are kept secure and private. Furthermore, because working practitioners do not always have the time to explore the nature, risks, benefits, and specifications of AI tools, managers who wish to introduce such tools will need to conduct such investigations. They might also assess possible impacts on clinical workflow, practitioner workload, and client finances. Finally, managers are advised to investigate impacts on the environment of AI systems with high resource requirements that cause pollution and carbon emissions.[68,69]

Veterinary Bodies

Veterinary boards are tasked with licensing practitioners and regulating the profession, while veterinary associations support practitioners and professional standards and provide advocacy for veterinarians and animal welfare. These bodies have a role in ensuring that use of medical AI by veterinarians is consistent with good clinical practice and patient well-being.

Because AI is an evolving and complicated technology with uncertain implications, veterinary bodies may see it as their responsibility to educate and advise practitioners

on AI use.[66] They might also call for additional collaborative research into veterinary AI[70] from academics and others well positioned to investigate veterinary AI safety, benchmarking, and the like.[71] Lastly, veterinary bodies could advise the profession on the need to educate veterinary students and practicing veterinarians about the use, risks, and benefits of medical AI.[72]

SUMMARY

This article examined key ethical considerations for AI tools in small animal veterinary medicine. Veterinary practitioners have profession-defining duties of beneficence and nonmaleficence toward their patients, as well as some duties regarding their clients. Practitioners should carefully weigh the benefits and risks to animals of AI tools so that they can promote patient health and welfare and inform and counsel clients accordingly. Parties who design and sell veterinary AI tools, manage veterinary hospitals, and regulate and oversee the profession are well positioned to support practitioners in discharging their core ethical responsibilities when using AI.

CLINICS CARE POINTS

- Veterinary medical AI tools can be beneficial, but raise both "machine" and "human" challenges that affect the core duties of beneficence and nonmaleficence toward animal patients.
- Practitioners must be aware of the "machine" issues of AI inaccuracy, bias, opacity, and data privacy and security.
- Practitioners must also negotiate "human" issues of overtrust, deskilling, cognitive load, misuse and abuse, and client attitudes regarding AI tools.
- To ensure animal patients are benefited and not harmed by AI tools, a range of accountability measures for AI developers and purveyers, practitioners, hospital managers, and veterinary bodies are important.

DISCLOSURE

The authors have nothing to disclose.

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