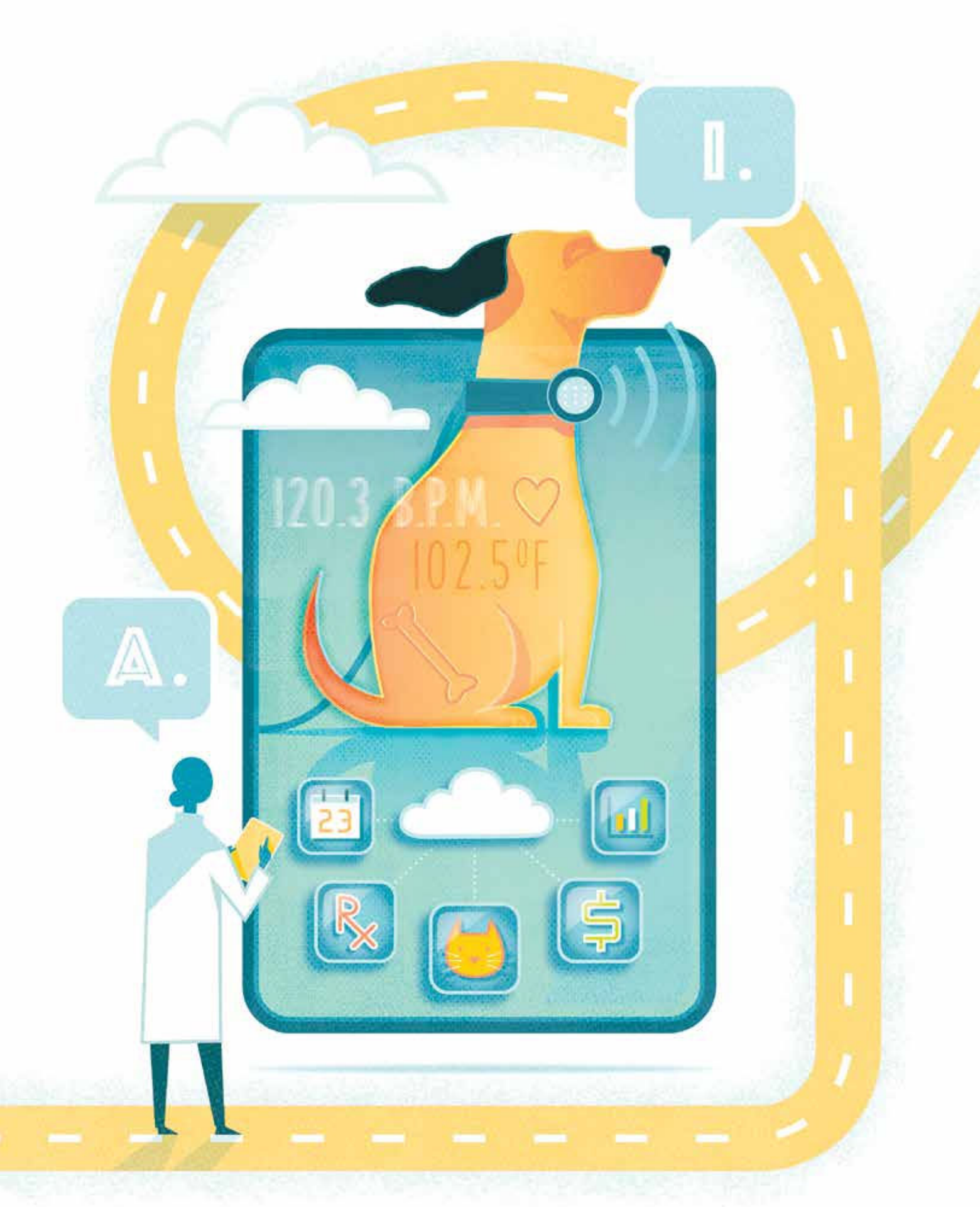






CLOSER THAN THEY APPEAR

What's "next" in animal health care is quickly becoming a reality. With the rapid progression of technology, increasing investment in the industry and growing demand from pet owners, technological advances in diagnostics, patient monitoring and point-of-care decision making have entered the market.

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BY MEMBERS OF THE VETERINARY INNOVATION COUNCIL
ILLUSTRATIONS BY ROCCO BAVIERA

Experts from the Veterinary Innovation Council developed a list of 11 trends that will make the biggest impact on animal health care in the coming years, from artificial intelligence–driven decision support to automatically transcribed patient records. Develop a road map for the future by preparing for the arrival of these innovations and where they may head in years to come.

What is the Veterinary Innovation Council?

The Veterinary Innovation Council (VIC) is a nonprofit, sponsor-driven organization that was created in collaboration with the NAVC to tackle the issues that affect the entire animal healthcare industry. While initial conversations were built around telemedicine, the labor shortage and access to veterinary care, VIC is now looking at artificial intelligence and technologies that will change the way veterinary medicine is practiced. The VIC board is composed of thought leaders across the industry. To learn more, visit veterinaryinnovation-council.com or reach out to us at vic@navc.com.

AI for Clinical Decision Support



After reading countless articles on artificial intelligence (AI) in preparation for writing this piece, I shared my findings with a group of veterinary friends while we were out at a local brewery. Most had heard of ChatGPT but few had used it for any veterinary purposes. Out came the phones and the group started tapping away. “Wow. I didn’t expect that,” was a pretty consistent comment as they typed in forms of signalment and asked for treatment plans. Then came, “Yep, that’s what I’d do.” Occasionally the chatbot would get things wrong — sometimes really wrong — but for the most part, the answers mirrored what the veterinarian would do. Then the variations began: “Create a patient handout for postsurgical concerns related to dental extractions.” Bam! What would take at least a few hours to create was complete within seconds. Again, not perfect, and not created on company letterhead, but pretty inclusive of the major concerns. Then the fun really began: patient handouts written in Jane Austen style (signed off, “cordially yours, your obedient servant”) or as a movie script. The possibilities are endless and entertaining. But outside of casual experimentation with friends, there are several ways in which this technology is being leveraged by players in the industry.

Treatment-Decision Tools: AI decision support tools can analyze a variety of factors, such as the patient’s age, breed, medical history and current condition, to provide personalized treatment recommendations. For example, the Clin.ai platform uses machine learning (ML) to analyze a pet’s medical records and suggest appropriate medications and dosages based on the pet’s individual characteristics.

Predictive Tools: There are tools that use ML algorithms to analyze a pet’s medical records and predict the likelihood of certain outcomes, such as

a pet developing a certain condition or requiring hospitalization. This information can help veterinarians develop care plans and provide proactive care. An example of a predictive tool is the Hello Ralphie chatbot, which uses natural language processing to provide pet owners with advice based on their pet’s symptoms. The chatbot can also predict the likelihood of a pet developing a condition, such as diabetes or arthritis, based on its age, breed and medical history, allowing pet owners to take proactive steps.

2 MONTHS

Time it took ChatGPT to gain 100 million monthly active users, making it the fastest-growing consumer application in history. — *Reuters*

Challenges and Limitations: While AI decision-support tools have the potential to revolutionize veterinary medicine, there are significant challenges. The first is the need for high-quality data. AI algorithms rely on large amounts of data to make accurate predictions and recommendations, so it is important for veterinarians to ensure that their data is accurate, complete and representative of the patient population.

Another challenge is the need for collaboration between veterinarians and AI developers. Developing AI decision-support tools requires a deep understanding of veterinary medicine and clinical decision making, as well as expertise in AI and ML.

Finally, it is important to note that AI decision-support tools are not meant to replace veterinarians or their clinical judgment. Rather, they are meant to support the veterinarian in their decision making. — *Aaron Massecar, MA, PhD*

EVOLUTIONS IN PATIENT MONITORING

2

Consumers have become accustomed to the insights that wearable technology can provide in their daily life: “I’m not feeling great, my WHOOP Sleep Score was terrible last night.” Or, “I need to stand for a bit or I’m never going to close the rings on my Apple Watch!” It’s only natural that those interested in gaining better insights into their pet’s health will seek out similar information.

The most advanced at-home patient monitoring systems are wearable devices that allow pet

owners to track their pet’s health and activity levels in real time. These devices come in a range of forms, from collars and harnesses to smart beds and cameras, and use a variety of sensors and technologies to monitor everything from heart rate and respiration to activity levels and sleep patterns.

One advanced at-home patient monitoring system is the PetPace Smart Collar, which uses advanced sensors to monitor a pet’s vital signs and activity levels and sends real-time alerts to pet owners and veterinarians if any abnormalities are detected. The PetPace collar’s sensors collect data on the pet’s temperature,

activity, pulse, respiration, positions, heart-rate variations and calories consumed and burned.

In addition to wearable devices, there are also advanced at-home monitoring systems that use cameras and sensors to track a pet’s behavior and activity levels. One example is the Furbo Dog Camera, which includes a high-definition camera, two-way audio and a treat dispenser, allowing pet owners to monitor their dog’s behavior and send commands or treats remotely.

The future of at-home veterinary patient monitoring is likely to involve even more advanced sensors and technologies, such as implantable devices that can track a pet’s vital signs and glucose levels in real-time, and AI systems that can analyze this data to detect patterns and identify potential health issues before they become serious.

Additionally, telemedicine platforms and remote monitoring tools are likely to become increasingly important for veterinary care, especially in rural areas or for pets with chronic conditions that require ongoing monitoring and support.

Overall, the most advanced at-home veterinary patient monitoring systems currently available use a combination of wearable devices, sensors and cameras to track a pet’s vital signs, activity levels and behavior in real time and provide pet owners and the veterinary team with valuable insights into the pet’s health and well-being.

As technology evolves, it is likely that these systems will become even more sophisticated, allowing for more accurate and comprehensive monitoring of pets outside of the veterinary clinic.

— AM

 **Telemedicine platforms and remote monitoring tools are likely to become increasingly important for veterinary care, especially in rural areas or for pets with chronic conditions that require ongoing monitoring and support.** 

NEXT-GEN WEARABLES AND THE DATA THEY REPORT

3

Have you ever wondered if your cat is as judgmental as their looks might suggest? So have the more than 17 million others who downloaded the smart app MeowTalk, which translates what your cat is saying. Cat and dog translators might be too much of a stretch for you,

but the other data-generating devices in the home likely won't be.

Many people are familiar with next-generation pet collars such as Whistle, PetPace, LinkAKC, Fi and others. There is a growing feature set to each of those companies. Whistle, for example, started off as a GPS tracker, then added additional sensors that allow it to determine whether your dog has an allergy before a

hotspot develops or whether its postsurgical recovery time is shorter or longer than anticipated. What was considered “smart” because of its sensors is now allowing owners to gain a better understanding of their animals because of the algorithms that have been applied to the collected data, thereby making the collars smarter. Some collars, like Invoxia, even provide wellness scores for your animal.

When you dig into this a little deeper, you start finding that not only are there more companies in the marketplace, but there are more companies whose sole function is to develop the technologies for other companies. For example, you'll never see SEACOMP's logo on any products, but you will likely have already engaged with one of the products that it helped bring to market. There are many companies like SEACOMP that partner with companies or individuals who have an idea for a product but don't have the resources to research, develop, produce and scale that product for mass market adoption. What the presence of companies like SEACOMP means is that it is becoming easier and easier to leverage existing technologies (for example, sensors found in wearables, in-home devices and even implantables), partner with technology development companies and bring the product to market at an accelerated pace. The proliferation of these devices means that more and more data will be generated and available to veterinary teams, but only if those teams know how to use them. — AM



At-Home Diagnostic Tools



I was at a healthcare information management conference and I heard more than a few speakers talking about the shifting landscape of veterinary care. According to these speakers, 30% of care is moving out

of the hospital and into the home. My first reaction: That seems impossible. My surprise and the fact that I surround myself with veterinarians are not unrelated: It seems like most veterinary professionals spend their time focusing on what's happening in the clinic and not enough time focusing on what's happening in the home. At-home screening tools have become increasingly popular in veterinary medicine, allowing owners to monitor their pets' health and well-being from the comfort of their own homes. While these tools can provide valuable insights into a pet's health status, they also require clinics to prepare for their use to ensure accurate and reliable results. If client demand continues to increase, it is best for veterinary professionals to understand these products so they can better work with and inform pet owners. Here are a few examples of how these tools work.

Blood Glucose Monitors: The AlphaTrak blood glucose monitoring system from Zoetis, designed for cats and dogs with diabetes, requires a small blood sample from the pet's ear or paw pad, with the results available in seconds. The device also stores past readings, allowing owners to monitor their pet's glucose levels over time.

Allergy Testing Kits: The Affordable Pet Labs allergy kit includes a collection swab that is used to collect a sample of the pet's saliva. The sample is then sent to a laboratory for analysis, and the results are available in a few days. The test can identify potential allergies to over 100 different substances, including common environmental allergens and food allergens.

DNA Testing Kits: The Wisdom Panel canine DNA test includes a cheek swab that is used to collect a sample of the pet's DNA. The sample is then sent to a laboratory for analysis, and the results are available in a few weeks. The test can identify the pet's breed ancestry and potential health risks based on genetic markers. — AM

How to Prep Your Clinic for At-Home Screening Tools

1 Educate team members and clients: Make sure your team is trained on how to interpret and respond to results, and provide resources for clients so they understand the role of these tests.

2 Select which tests to offer: There are a variety of at-home screening tools, including urinalysis, genetics and behavioral analysis. Set a standard that will be offered or encouraged for use.

3 Choose reliable test kits: It's important to identify

test kits that are reliable and accurate. Look for those that have been validated through clinical studies and have a high level of accuracy.

4 Develop protocols for collecting samples: Set a protocol for how to properly store and transport kits, and make sure your team is trained on these standards.

5 Create a system for tracking and interpreting results: At-home screening tools generate a large amount of data, so it's important to have

a system in place for tracking and interpreting results. Consider using software or other tools to manage this data and ensure that it is accessible.

6 Communicate results with clients: Once you have collected and interpreted the results of at-home screening tools, it is important to communicate these results in a clear and concise manner. Provide recommendations for next steps, such as scheduling a follow-up appointment or making lifestyle changes to improve their pet's health.

WILL YOU EVER HAVE TO WRITE A PATIENT RECORD AGAIN?



I've heard that a veterinarian can spend, on average, about two hours a day writing medical records. Some stack those up until the end of the day and either slap the keyboard for a few hours before heading home or wait until they get home, put their kids in bed and work at the kitchen table or couch until late in the night. A few practices have taken the step to hire scribes to take notes and ensure the medical records are up to date.

Then there's the tech-savvy route: leveraging speech-to-text software. There is no training required — the veterinarian just needs to dictate into a device and the medical record is up to date. Dragon Medical offers a solution and Talkatoo offers

a veterinary-specific library that makes transcribing medical terminology more accurate. These tools work as speech-to-text dictation tools, which allow users to speak into their computer's microphone or an external mic and the tool types out the text as a keyboard extension.

But what if there was a way to skip the process of hiring and onboarding a scribe or dictating into a machine? These tools already exist in human health care. Products such as Augmedix, Speke and others are fully developed and could have veterinary applications. The promise of these technologies is that they can run in the background as an ambient listening device and the medical record will automatically be populated with the correct information in the proper data fields. Most people

who have tried these platforms acknowledge that they're not perfect — they often require careful review and edits. But, based on the progression of this technology, we could be approaching a time when the doctor simply cues the technology to start

Software like this leverages journal databases (e.g., the *Journal of the American Veterinary Medical Association*) in order to look at the most up-to-date literature on a particular disease and recommend a course of action based on the findings. These

16.6%

Share of weekly working hours human medical physicians spend on administrative tasks.

— *International Journal of Health Services*

a medical record, along with who the doctor is speaking to, and the software will populate the record.

The next step, a step that companies are already working on, is for the software to do more than record the exchange: It will propose a treatment plan based on the signalment.

solutions are not widespread, but as William Gibson said, the future is here, it's just not evenly distributed.

Imagine how the daily schedule of veterinarians might look if writing medical records was a thing of the past and they were able to leverage the latest scientific research for each patient. — AM

Diagnostics: Faster, More Accurate and Cheaper?



Take a sprinkle of advanced AI technology and add a heavy dose of medical data points. That is the recipe for powerful diagnostic tools that can assist clinicians in making informed diagnostic decisions and catch easy-to-miss signalment. This emerging technology is already making an impact in three areas, with room for vast growth.

Radiology

AI is being used in radiology to improve the accuracy, efficiency and speed of diagnosis. AI algorithms can be trained to identify patterns in medical images that are nearly invisible to the human eye, helping radiologists diagnose diseases earlier and more accurately.

There are a number of ways that AI is being used in radiology. One way is to develop algorithms that can automatically detect abnormalities in medical images. These algorithms can help radiologists identify potential problems more quickly, which can lead to earlier diagnosis and treatment. Another way that AI is being used in radiology is to develop algorithms that can help radiologists interpret medical images. For example, AI algorithms have been developed that can help radiologists identify the location and extent of a tumor in an MRI scan.

Ultrasonography

AI is being used with ultrasonography in a number of ways to improve the precision, efficacy and speed of diagnosis. AI algorithms can be trained to identify patterns in ultrasound images that clinicians might not be able to catch. This can help radiologists diagnose diseases as soon as possible and more accurately.

Here are some specific examples of how AI is being used with ultrasonography:

- **Automated detection of abnormalities.** AI algorithms can be used to automatically detect abnormalities in ultrasound images, such as tumors, cysts and fluid collections. This can help

radiologists identify potential problems more quickly, which can lead to earlier diagnosis and treatment.

- **Quantification of measurements.** AI algorithms can be used to quantify measurements in ultrasound images, such as the size of a tumor or the thickness of a heart valve. This can help radiologists make more accurate diagnoses and to plan more effective treatments.
- **Image guidance.** AI algorithms can be used to guide ultrasound probes during procedures, such as biopsies and needle aspirations. This can help improve the accuracy and safety of these procedures.
- **Image interpretation.** AI algorithms can be used to help radiologists interpret ultrasound images. This can help improve the accuracy and efficiency of diagnosis.

Cytology

AI is still a relatively new technology in cytology, but it has the potential to revolutionize the way cytology is used in clinical practice. As AI algorithms continue to develop, they will become even more powerful and accurate. As these tools enhance, they will lead to better outcomes for patients and help to improve the quality of animal health care.

Here are some examples of companies that are developing AI-powered cytology solutions:

- Many companies, like IDEXX and Antech, use AI to identify regions of interest but not for diagnosis.
- Zoetis with Vetscan IMAGYST uses automated AI results for fecal, blood and dermatologic samples but not for cytology.
- Most cytology companies are unwilling to provide a specific report with specific results in the way that, for example, SignalPET does for radiology.

As these technologies continue to develop, they have the potential to revolutionize the way that veterinary clinicians progress through a diagnostic workup. — AM

Shifts in the Veterinary Business Model



In 2020, I was sitting at a conference, listening to speakers talk about how they evaluated practices before deciding whether to purchase. The standard form of measurement that they used was a multiple of earnings

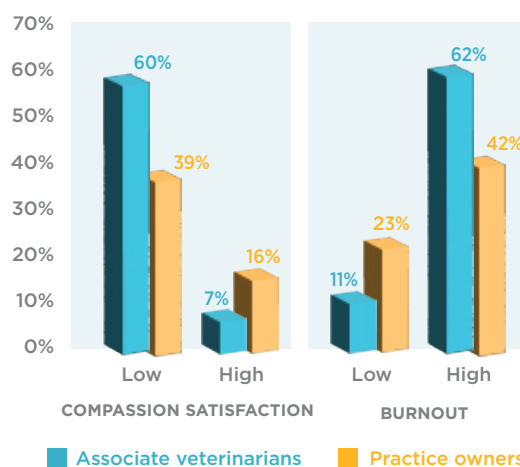
before interest, taxes, depreciation and amortization (EBITDA) that is calculated on a yearly basis. In 2015, it was rare to hear of a practice being sold for more than 15 times EBITDA, but in 2020, some practices were being sold at 30 times EBITDA. Multiple factors contributed to this. For one, consolidators knew that they could come into a practice and create efficiencies of scale through bulk purchasing across a practice group, reduce overhead and run the practice more proficiently, at least on paper. They could then sell the practice because they had increased its overall value. Their goal wasn't anything other than selling for a higher multiple than what they bought it for.



Today we're seeing a massive clawback in the total number and total dollars invested in the industry.

Another driver was the amount of investment that was coming into the veterinary space. It's hard to get exact numbers, but some estimate that there was nearly a doubling of new investments in the industry. For some investors, this came as a result of the adage that pet care is recession immune; for others, it was simply because of a gap in their investment portfolio.

Today we're seeing a massive clawback in the total number and total dollars invested in the industry. Again, exact numbers are difficult to come by, but based on conversations with people across the industry, a lot of startups are seeking additional rounds of funding that are either taking longer or not being realized at all, which results in a lower valuation of the company. In addition, the buying frenzy that drove up practice valuations is



If practice ownership trends back toward individuals, it could bring positive benefits for veterinary professionals. A 2022 study from the AVMA found a positive correlation between practice ownership and personal well-being.

Source: <https://bit.ly/3JsQySi>

cooling off. All of this is putting pressure on practice models that were primarily focused on growth and expansion and are now moving toward cost cutting.

What's Next for Practice Ownership

Where might things go in the future? If the valuations keep coming back down to prepandemic levels, then we might see less competition driven by consolidation groups and more opportunities for individual veterinarians looking to purchase a practice. The challenge here is that many graduates are coming out of their programs today without an interest in ownership. That's where programs like Suveto's Harbor.vet Student Hospital Immersion Program can play a role. It helps to train the next generation of practice owners through a mentorship model that allows the veterinarian to gradually assume responsibility for running a practice. There are many more like it. For example, Veterinary Practice Partners offers training programs that help with the transition. What we're likely to see in the coming months is a slowdown in venture capital and an increase in individual practice ownership.

—AM

THE EVOLUTION OF PRACTICE MANAGEMENT SYSTEMS



There are few situations that cause more consternation in a veterinary clinic than thinking about switching to a new patient management system or practice information

management system (PIMS). In the past, startups such as ezyVet and Vetspire came into the market and pushed the envelope with streamlined designs that were cloud-based and therefore more accessible from more locations. Within the past couple of years, ezyVet was acquired by Idexx and Vetspire was acquired by Pathway/Thrive. That doesn't mean that innovations will cease with either of these products, but historically products tend to become less likely to roll out new features when they're not trying to capture more market share and compete with other emerging products.

However, this trend does not completely inhibit innovation in this sector and there are still many independent options available. For example, Clini.ai, Veterinarian Electronic Assistant and Instinct are all rolling out features that are pushing the PIMS industry forward. Here are a few ways in which PIMSs might advance in coming years.

One area that is ripe for innovation is the integration of AI and ML into these systems. By leveraging the power of AI and ML, veterinary practices can gain valuable insights into patient data, treatment outcomes and disease trends. This can help veterinarians make more informed decisions and provide better care for their patients.

A second area for improvement is the adoption of cloud-based systems. Cloud-based systems offer many benefits, including improved security, accessibility and scalability. By storing patient data in the cloud, practices can access their records from anywhere and easily scale up or down as their needs change. When that data is stored in the cloud, it makes portability and

transferability easier too.

Telemedicine is also likely to play a bigger role in the future of PIMSs. With telemedicine, veterinarians can offer remote consultations, monitor patients remotely and provide follow-up care without the need for in-person visits. This can be particularly beneficial for patients in rural areas or those with mobility issues.

Another trend that is likely to continue is the focus on client engagement. As pet owners become more tech-savvy, they expect to be able to communicate with their veterinarian more easily and have access to their pet's medical records and treatment history. By offering online portals and mobile apps, veterinary practices can provide a more convenient and personalized experience.

The future of patient management systems and PIMSs is bright, with many exciting innovations on the horizon. By leveraging AI and ML, adopting cloud-based systems, embracing telemedicine and focusing on client communication, veterinary practices can improve patient care and stay ahead of the curve in an increasingly competitive industry. — AM



ENHANCING WORKPLACE CULTURE

9

There I was many years ago, an educator and scholar at the University of Missouri's Middlebush Equine Center — and unofficial sounding board for the veterinary nurses/technicians. They would share everything from their career aspirations to the barriers they encountered daily. They loved their positions caring for patients and teaching. It was a fulfilling job. They weren't complaining, even as they worked tirelessly with salaries that would not sustain them long term. But they wanted someone to inspire them, support them, understand what they do, help them progress in their career and listen. They wanted veterinarians to treat them as the important veterinary

professionals that they were. Sound familiar? Today, the profession faces the challenge of attracting and retaining key members of the veterinary team. Innovative solutions are required to face this age-old issue.

It would be easy at this point to make the obvious recommendation for all to use veterinary nurses/technicians maximally at the top level at which they can be trained and to reward them financially for doing so. Yes, that is true and necessary. But as we look to the future of practice, we must also consider workplace culture and its impact on empowering every member of the healthcare team.

As leaders, we need to inspire individuals, teams and even ourselves. Leaders are first and foremost responsible for creating and maintaining the desired culture throughout the organization. Today,

that culture must include clear signals about the importance of each person on the team, along with integrity, transparency, inclusion and communication. The culture should foster positive attitudes about change that include using veterinary nurses/technicians at the top of their license and taking risks for the purpose of excellence. The environment must be one in which the veterinary nurses/technicians feel free to make suggestions for improvement, even inspired to do so. They should not only be encouraged, but also rewarded for doing so. They should be acknowledged openly and praised for their positive contributions, even those that are not adopted immediately or those that fail.

As a result, they will feel recognized, as feelings of trepidation, inadequacy and alienation are overcome by expressed belief in what they do and

offer. A tradition of contributing ideas, trying new things and being rewarded accordingly becomes contagious throughout the organization.

It is nothing short of amazing to watch organizations evolve favorably as a result of creating an authentically supportive environment in which their people are valued and leaders display empathy.

It is important to recognize that change does not happen overnight. Additionally, most employees do not feel meaningfully connected to the culture of their organization, so patience is important. Leaders must determine and communicate the desired culture, such as through vision and mission. More importantly, they must live the culture themselves, model desired behaviors and motivate others to do the same.

— Eleanor Green,
DVM, DACVIM,
DABVP

Vetting Considerations for AI Technology

10

AI-based systems are now available to veterinarians around the world. However, these products may find themselves in a

regulatory vacuum and clinicians should be aware of not only the potential, but also the limitations of such systems. Where AI for human health is regulated by organizations such as the FDA in the U.S., similar regulation is not present in veterinary medicine. Therefore, commercial products enter the market with limited underlying scientific evidence. The potential for AI is enormous; however, as these novel technologies find their place in practice, veterinary clinics must establish their own safeguards and considerations for use. A framework for evaluating AI in veterinary radiology has been proposed by Joslyn and Alexander.¹ To apply this framework, veterinary professionals should consider the clinical task, clinical relevance and impact, model type, dataset and training, performance metrics, algorithm retraining and error management, sources of bias, compatibility and usability and financial, medico-legal and ethical considerations. This is considered appropriate for veterinary radiology and across veterinary medicine where AI is being deployed. While the entire framework is vital to consider, focus on these three high-level considerations:

1. Training and Testing Data: If an AI system claims to be 90% accurate for diagnosing disease X, veterinary professionals should understand how the AI got there. For example, how many cases of disease X were present in the training and testing sets? This can help identify bias in the AI model. Importantly, the training and testing data must be separate for every system.

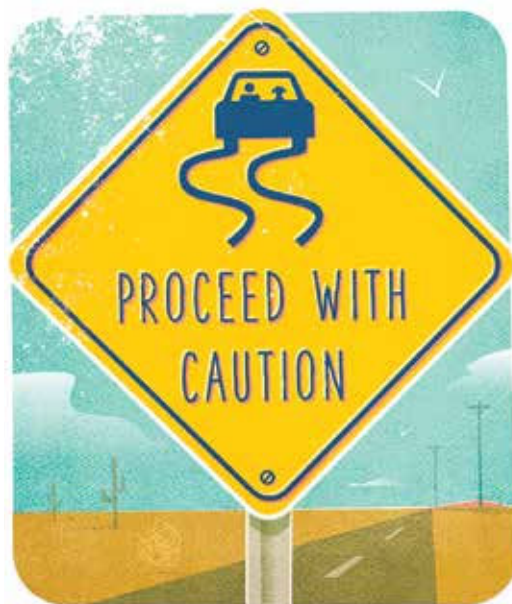
2. Ongoing Quality Control: Just like any diagnostic, AI should be subject to quality control.

One should be able to test the AI system on their own data and ensure that it meets the metrics that it claims. Commercial AI systems should have mechanisms for error reporting and follow up.

3. Ethical Considerations²: Using AI in veterinary practice opens practices up to liability that has not yet been tested in a legal setting. The responsibility likely lies with the attending veterinarian when AI systems make an error. If the underlying performance of these systems is not well understood, veterinarians may not identify inaccuracies prior to a medical error.

Overall, while AI is likely to reshape veterinary practice in the coming years, care should be taken when considering deploying AI in one's practice at this stage. Practices, clinical groups and organizing bodies should work together to provide guidance in order to best support innovation in practice in a safe and responsible way.

— Ryan B. Appleby, DVM, DACVR



1 Joslyn S, Alexander K. Evaluating artificial intelligence algorithms for use in veterinary radiology. *Vet Radiol Ultrasound*. 2022;63(Suppl 1):871-879. <https://doi.org/10.1111/vru.13159>

2 Cohen EB, Gordon IK. First, do no harm. Ethical and legal issues of artificial intelligence and machine learning in veterinary radiology and radiation oncology. *Vet Radiol Ultrasound*. 2022;63(Suppl 1):840-850. <https://doi.org/10.1111/vru.13171>

Precision Medicine in Veterinary Oncology



Precision medicine has revolutionized human medical practice, particularly in oncology. The term “precision medicine” in no way

implies that other types are “imprecise,” just that we now have tools that allow us to know exactly what is happening in a specific animal’s disease, and no longer have to draw conclusions based on clinical presentation or history. A clinician in many cases no longer has to play the odds.



There are companies that can quickly assess the mutations driving a specific dog’s cancer and, once identified, recommend targeted therapies that are safe and likely efficacious.

Veterinarians and veterinary nurses/technicians in clinical medicine should familiarize themselves with this technology, as it offers huge upsides for patients and practitioners. Potential cases that could benefit from these tests and approaches are seen in general practice every week, and options now exist to keep those cases (plus the client and the revenue) in the clinic — so use them!

When the human genome was sequenced in 2002 (the canine genome quickly following in 2004), the excitement level was at an all-time high. We thought that there would be a few key findings — mountains in the genomic landscape — that would help us unlock the secrets to disease. However, the landscape proved to be more complex than that. It has long been accepted that most, if not all, cancers are caused by mutations in DNA that cause the cell experiencing the mutation to ignore the normal rules and begin to divide uncontrollably. Early in genomics, we thought there would be a handful of mutations common to all tumors that would explain this behavior. It turns out there are hundreds. And many of them interact in complicated ways. Sometimes

mutations that impact different molecular pathways result in the same type of tumor. This can be confusing and complex, but thanks to new, cheaper ways to sequence DNA and massive increases in computing power, these landscapes are beginning to be mapped out.

But there is another, more hopeful side to this evolving understanding of cancer’s root causes. If you understand which mutations are driving the growth of a specific tumor (not most of that tumor type, or 72% of that cancer, but that exact tumor, in that dog, on the exam table), then there might be drugs that counter the effect of that mutation. These are called targeted or precision medicines. They target and counteract the effect of the mutation in cancer cells, usually without harming cells that don’t have the mutation. These are very different than traditional chemotherapies that usually attack and kill all rapidly dividing cells. There are more than 145 of these therapies approved by the FDA for use in humans. There is usually extensive safety data for these drugs in dogs, generated as part of the FDA approval process. Efficacy data in dogs is being generated all the time. So the combination of these three factors — an increasing understanding of the genomics behind cancer, an increasing ability to detect the mutations driving a tumor’s growth, both combined with increased availability of drugs that target the exact mutations in those tumors — is what makes it such an exciting time in oncology. There are veterinary companies that can quickly assess the mutations driving a specific dog’s cancer and, once identified, recommend targeted therapies that are safe and likely efficacious.

The tests and therapies aren’t cheap, but because they could eliminate much of the expense and inconvenience of traditional chemotherapy, the total cost of this approach might actually be less expensive and have higher compliance rates for cancer treatment than what we’ve become used to in the past. We are in early days, but this is a very rapidly evolving field due to the enormous resources being committed in human health care, and inevitably availability will go up as prices go down. — *David Haworth, DVM, PhD*

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Dr. Appleby is a boarded radiologist and faculty member at the Ontario Veterinary College. His research focuses on the use of artificial intelligence in veterinary imaging. He is the 2023 chair of the ACVR/ECVDI Artificial Intelligence Education and Development Committee. Dr. Appleby is passionate about education and technology and is a cofounder of Obi Veterinary Education, a website dedicated to delivering education in short, manageable segments.



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Dr. Haworth is the president and cofounder of Vidium Animal Health, a genomics-based precision diagnostics company, and serves on numerous for-profit and nonprofit boards. Previously, he was the president of PetSmart Charities in the U.S. and Canada, the largest grant-making animal welfare organization in North America, and president and CEO at Morris Animal Foundation, along with years of additional industry experience.



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Dr. Massecar is the executive director of the VIC. After completing his doctorate in philosophy, he transitioned to veterinary medicine and worked with Texas A&M to build the Veterinary Entrepreneurship Academy and then with the NAVC to bring about the Veterinary Innovation Summit. His professional interests include helping drive awareness across the industry in terms of innovation, entrepreneurship and artificial intelligence. ■