

Beyond the Algorithm: Wearable, Implantable, and Diagnostic Hardware in the Age of Veterinary AI

Dr. Mark A. de Wolde DVM MRCVS
March 2026

Executive Summary

Veterinary medicine is entering a new era where AI-enabled hardware transforms patient care from episodic visits to continuous monitoring. This presentation explored how wearables, implantables, and diagnostic devices are revolutionizing veterinary practice by providing real-time physiologic data that enables predictive, personalized medicine.

Key Concepts

The Hardware Revolution

- Beyond Software: While early veterinary AI focused on electronic records and decision support, hardware now bridges the gap between digital intelligence and real-world biology
- Continuous Care: Modern devices transform veterinary medicine from "postcard medicine" (brief clinic snapshots) to continuous health monitoring
- Three Categories: Wearables (external sensors), implantables (subcutaneous devices), and clinic tools (AI-enhanced diagnostics)

Market Growth

- Pet Wearables: USD 2.59 billion (2024) → USD 6.59 billion (2032), 12.4% CAGR
- Veterinary AI Diagnostics: USD 9.75 billion (2025) → USD 18.86 billion (2033), 8.6% CAGR
- Driven by miniaturization, connectivity, and consumer expectations shaped by human wearables

Current Technologies

Wearable Devices

Activity-Focused

- FitBark: Lightweight tracker (10-17g) quantifying activity through "BarkPoints"
- Whistle: GPS + wellness metrics with waterproof design and easy charging
- Tractive: Real-time GPS with geofencing and wellness indicators

Health-Focused

- PetPace: Comprehensive vital signs monitoring with patented pain detection algorithm
- Maven: AI-powered baseline detection for early illness alerts

Implantable Technologies

Continuous Glucose Monitors (CGMs)

- Dexcom G6: 1,400+ readings/day for diabetic management
- Eversense XL: 180-day implantable sensors
- Improved glycemic control by 35% versus traditional monitoring

Neural Interfaces

- Implantable EEG for seizure detection and prediction
- Vagus nerve stimulators for epilepsy and inflammatory disease
- Future: Brain-computer interfaces for animal communication

Clinic-Based AI Hardware

Radiology AI

- Vetology: Virtual AI radiologist providing reports within minutes
- AI classifiers for thoracic and abdominal imaging
- 60% improvement in arrhythmia detection sensitivity

Diagnostic Tools

- Smart analyzers for cytology and parasitology
- Real-time quality assessment reducing radiation exposure
- Automated measurements improving consistency

Case Study: NerveX Neurotechnologies

Company Overview: Founded by human epilepsy scientists, focusing on canine and feline neural applications

Products:

- ANIMO: Implantable neuromodulation for canine epilepsy (50-70% seizure reduction)
- NxSCOPE: Clinical biosensor suite for real-time exam data capture
- NxVET: AI practice platform integrating sensor data with EMRs

Impact: 2.5 hours saved per day in documentation, 30% reduction in ECG errors

Data Integration and Software

Sensor-to-Insight Pipeline

1. Hardware sensors capture continuous physiologic data
2. Cloud platforms aggregate and process data streams
3. AI algorithms identify patterns and detect anomalies
4. Clinical dashboards deliver actionable insights to veterinarians
5. Mobile apps engage pet owners in care management

Multimodal Synthesis

- Combines X-rays, retinal imaging, lab results, and wearable data
- Feline chronic kidney disease: 24-month prediction with 89% specificity
- 72% earlier disease detection versus traditional methods

Advanced Features

- Ambient documentation: 94% accurate SOAP note generation
- Predictive models: Individual risk assessment based on continuous data
- IoT integration: Seamless device connectivity and data sharing

Clinical Implementation

Interpreting Device Data

Key Principles:

- Focus on trends rather than individual data points
- Establish patient-specific baselines over time
- Consider environmental and behavioral context
- Balance sensitivity versus specificity for different conditions

Managing False Positives:

- Seizure detection: 92.6% positive predictive value, 0.018 false positives/day
- Clear communication about system limitations prevents owner anxiety

- Tiered response protocols prevent alert fatigue

Integration with Clinical Practice

- Device data complements, never replaces, physical examination
- Use wearables to guide focused clinical investigation
- Confirm device findings with traditional diagnostics
- Document device type, placement, and clinical reasoning in records

Ethical Considerations

Core Principles

1. AI Should Aid, Not Replace: Veterinarians remain the diagnostic authority
2. Bias Awareness: Training data skewed toward popular companion animals
3. Privacy Protection: Clear data ownership and sharing policies
4. Welfare Focus: Technology must demonstrably reduce animal suffering
5. Accessibility: Prevent creation of two-tiered care system

Professional Responsibilities

- Maintain clinical judgment even when following AI recommendations
- Understand AI system limitations and confidence levels
- Educate clients about device capabilities and constraints
- Advocate for transparent, evidence-based AI development

Future Outlook

Years 1-5

- Wearables become standard for chronic disease management
- AI radiology integrated into most practices
- Multimodal data platforms mature
- Continuous glucose monitoring adoption increases

Years 5-10

- Neural interfaces for seizure prediction and control
- Bioelectronic medicine treatments expand
- Biodegradable implants eliminate removal surgeries
- Speculative human-animal communication interfaces

Practical Implementation Guide

Getting Started

1. Choose One Technology: Master a single device before expanding
2. Verify Evidence: Select devices with peer-reviewed validation studies
3. Ensure Integration: Confirm compatibility with practice management systems
4. Train Team: Educate all staff on interpretation and limitations

Client Communication

- Explain what devices measure and what they cannot detect
- Clarify monitoring versus diagnosis distinction
- Discuss false positive/negative rates transparently
- Establish clear protocols for when device data warrants clinic visits

Validation in Practice

- Compare device readings to gold standard measurements
- Track diagnostic accuracy against specialist confirmations
- Document cases where devices helped or misled
- Share experiences with colleagues and manufacturers

Resource Directory

Professional Organizations

- American College of Veterinary Radiology (ACVR)
- European College of Veterinary Diagnostic Imaging (ECVDI)
- Digital Veterinary Medicine Forum
- AI VetNet professional network

Validated Platforms

Wearables: PetPace, FitBark, Whistle, Tractive

Imaging AI: Vetology, IDEXX AI platforms

Implantables: NerveX ANIMO, Dextronix cardiac devices

Software: ScribbleVet, co-vet, PetsOpiaAI, Pointer Health

Evidence Sources

- Peer-reviewed publications in veterinary journals
- ACVR/ECVDI position statements on AI use

- Manufacturer clinical validation studies
- Multi-institutional trial results

Critical Research Gaps

- Long-term outcomes of continuous monitoring programs
- AI performance in clinically ambiguous cases
- Economic cost-effectiveness analysis
- Impact on client anxiety and satisfaction
- Optimal integration with traditional diagnostic methods

Action Items

Immediate (Next Week)

- Evaluate one device category for practice integration
- Develop client education materials on device limitations
- Create protocols for responding to device alerts
- Join professional networks discussing veterinary AI

Medium-term (3-6 Months)

- Implement team training on device data interpretation
- Establish validation protocols comparing devices to gold standards
- Develop tiered alert response systems
- Create documentation standards for device-influenced decisions

Long-term (1-2 Years)

- Participate in multi-center validation studies
- Contribute to professional AI guidelines development
- Evaluate practice outcomes and efficiency improvements
- Consider advanced integration with specialty referral networks

Conclusion

The future of veterinary medicine lies in the thoughtful integration of AI-enabled hardware with clinical expertise. Success requires:

- Evidence-based adoption of validated technologies
- Continuous learning to keep pace with rapid innovation
- Ethical frameworks that prioritize animal welfare

- Team-based approaches that leverage technology while preserving the human elements of veterinary care

Hardware represents the next frontier in veterinary AI—not as replacement for clinical judgment, but as amplification of our capacity to heal, predict, and prevent disease. The veterinarians who thoughtfully integrate these tools while maintaining professional authority and ethical standards will define the future of animal healthcare.