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Opportunities for the Enhancement of Antimicrobial Stewardship in Companion Animal and Equine Medicine in Ontario

Prepared for the College of Veterinarians of Ontario

ACER CONSULTING

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Executive Summary

Background

Antimicrobial resistance (**AMR**) is a growing global threat that undermines the effectiveness of essential veterinary and human medical treatments. The College of Veterinarians of Ontario (**CVO**) has an important leadership role in promoting responsible antimicrobial use (**AMU**) and advancing antimicrobial stewardship (**AMS**) within the province. Understanding how and why antimicrobials are prescribed, and the barriers veterinarians face in adopting stewardship-aligned practices, is essential to shaping effective policy and professional support. The College commissioned ACER Consulting to help build a deeper understanding of AMS in Ontario's companion animal and equine veterinary sectors by exploring prescribing practices, behavioural and systemic drivers, and opportunities for regulatory and professional leadership.

Methods

The study combined three components:

- **Literature Review** – A review of primary and grey literature on factors influencing AMU and AMS in veterinary practice, with emphasis on Canadian, North American, and comparable jurisdictions.
- **Key Informant Interviews** – Semi-structured interviews with 11 subject matter experts from academia, public health, and professional associations to gather insights into current challenges and opportunities in veterinary AMS.
- **Focus Groups** – Six 90-minute focus groups with 26 veterinarians from the companion animal and equine sectors to validate findings and explore real-world experiences and barriers to stewardship adoption.

Key Findings

Current State of AMS in Veterinary Practice

Awareness and adoption of AMS vary widely across species and practice types. Food-producing animal medicine has made the most progress, supported by regulations and industry expectations. In contrast, small animal and equine practices remain less advanced, with prescribing habits often shaped by clinician habit, client expectations, and time pressure. Across all sectors, diagnostic testing is infrequent due to cost and logistical barriers. Participants reported that momentum following Health Canada's 2018 regulatory changes has slowed, with little ongoing federal or provincial leadership. The absence of national policy for companion animal medicine, inconsistent AMS education, and unclear clinic-level expectations were noted as key gaps. Overall, AMS integration in Ontario veterinary practice remains inconsistent and under-supported, with few incentives or structures promoting change.

Influences on Stewardship Adoption

Intrapersonal Factors. Veterinarians' personal beliefs, knowledge, and confidence strongly influence AMS adoption. Most acknowledge AMR as serious but often view it as a collective, rather than individual, responsibility, reducing personal accountability for stewardship. Education and experience are central drivers. Veterinarians with formal AMS training or recent graduates tend to demonstrate stronger stewardship awareness and confidence. However, AMS content in veterinary curricula is inconsistent, and continuing education (**CE**) options are often limited or impractical. Many practitioners express uncertainty about what AMS looks like in daily practice or how to balance stewardship with animal welfare and client satisfaction. Confidence and self-efficacy also play a role: clinicians who feel assured in their diagnostic and treatment decisions are more likely to use AMS-aligned practices, while uncertainty fosters reliance on habitual prescribing. Educational interventions have been shown to reduce antimicrobial use and promote lower-importance drugs, yet gaps in familiarity with guidelines persist.

Interpersonal Factors. Relationships within clinics and between veterinarians and clients strongly affect prescribing. Perceived client expectations for antibiotics remain one of the most powerful pressures driving unnecessary use. Veterinarians often feel compelled to prescribe to maintain client satisfaction, avoid conflict, or prevent complaints. Misunderstandings about AMR, cost sensitivity, and a desire for quick results reinforce this dynamic. Effective communication can counter these pressures: when veterinarians clearly explain diagnostic reasoning and treatment choices, clients are more likely to accept non-antibiotic options. However, this requires time and communication confidence, both of which are often limited. Clinic culture also shapes prescribing behaviour. Norms set by senior veterinarians and reinforced by peer expectations influence how AMS is practiced. In hierarchical or time-pressured environments, junior staff and technicians may have little input despite playing key roles in client education. Conversely, clinics that foster open discussion, teamwork, and shared responsibility are more likely to sustain stewardship practices.

External Factors. Systemic and structural conditions define the practical limits of stewardship. Limited access to affordable and timely diagnostics is one of the largest barriers. High costs, slow turnaround, and logistical hurdles discourage culture and sensitivity testing, driving reliance on empirical treatments, especially when time or budget constraints exist. Access to practical AMS guidelines and decision-support tools is also inconsistent. Existing resources are often generic, outdated, or not integrated into clinic workflows, forcing veterinarians to depend on habit rather than standardized best practices. Time and workload pressures compound these issues. Short appointments and high caseloads make it difficult to conduct diagnostics or engage in detailed client communication. In such contexts, prescribing antimicrobials can seem the most efficient or least risky choice. Economic factors also play a major role. Diagnostic testing costs, client financial limits, and restricted drug formulation options often encourage "convenience prescribing." Without financial or policy incentives, stewardship remains more of a professional aspiration than a practical expectation.

Together, these intrapersonal, interpersonal, and systemic barriers create a complex environment where even motivated veterinarians face challenges implementing AMS consistently. Meaningful progress will require coordinated leadership, better education, and systemic supports that make stewardship the easier and more rewarding choice.

Validation from Focus Groups

Focus group participants confirmed the findings, describing incremental gains in AMS awareness but persistent challenges related to economics, client expectations, and uneven access to practical guidance. Clinic culture and peer influence were consistently identified as major determinants of prescribing behaviour. Clinics that promoted open discussion, evidence-based practice, and tools like the *Firstline* app showed stronger AMS uptake. Conversely, resistance from senior practitioners and lack of team inclusion slowed progress. Participants emphasized the need for accessible, relevant CE focused on first-line antimicrobial selection, diagnostic interpretation, and client communication. Current CE opportunities were viewed as limited and disconnected from real-world challenges.

Participants stressed the importance of pragmatic approaches that balance stewardship ideals with operational realities. Despite these obstacles, veterinarians viewed AMS as a professional duty and expressed strong interest in clearer guidance, practical tools, and supportive regulations that make stewardship both viable and valued.

Opportunities for the Advancement of Antimicrobial Stewardship in Veterinary Medicine

Drawing on literature, expert interviews, and practitioner focus groups, this final section offers practical opportunities for actions the CVO could take to promote consistent, evidence-based prescribing among Ontario companion animal and equine practices.

1. Strengthen Leadership and Recognition

Participants called for CVO and national partners such as the Canadian Veterinary Medical Association (CVMA) and Canadian Council of Veterinary Registrars (CCVR) to take a leadership role in promoting AMS as “good medicine” rather than regulatory compliance. A Veterinarian or Clinic AMS Recognition Program could celebrate excellence and shift professional culture toward AMS. A set of additional accreditation or quality assurance standards that allow veterinarians and clinics to voluntarily take a more advanced role in antimicrobial stewardship may promote and reinforce a culture of stewardship. Recognition through other veterinary leadership groups through awards, features, or accreditation would normalize best practices and build motivation. Clinic-level leadership was viewed as essential. Designating AMS champions, veterinarians, technicians, or other staff, can integrate stewardship into daily routines, lead education, and maintain clinic policies. CVO could explore supporting this model by providing templates, guidance, and opportunities for champions to share experiences and strategies, with an overarching goal of reinforcing a culture of professional pride in AMS.

2. Provide Practical, Evidence-Based Guidance and Tools

Veterinarians consistently identified the need for clear, concise, and species-specific AMS resources that fit into clinical workflows. Existing materials are fragmented and often impractical. Developing a centralized AMS toolkit that consolidates trusted guidance and decision aids would directly support confident prescribing. The toolkit should provide resources for practitioners looking to develop their

understanding of stewardship and navigate guidelines, link to resources such as the International Society for Companion Animal Infectious Diseases (ISCAID), the CVMA, and the Farmed Animal Antimicrobial Stewardship (FAAST) Initiative, and include accessible readings like “case of the week” features. Equine practitioners emphasized the need for updated guidance and research support to clarify appropriate antimicrobial use.

3. Reframe AMS as a Core Professional Responsibility

Veterinarians view AMS as part of their ethical duty and professional privilege to prescribe responsibly, yet some remain uncertain whether regulators will support them when clients demand antibiotics. Clear communication from CVO affirming that evidence-based decisions are supported may empower veterinarians. A targeted communication campaign could embed AMS messaging across CVO and partner communications, framing AMS as central to professional integrity, animal welfare, and public health protection.

4. Integrate AMS into Licensure, Accreditation, and Continuing Education

Integrating AMS expectations into existing professional systems would ensure consistency and accountability. Mandatory, concise AMS training modules during license renewal could align veterinarians on current best practices, as already required in other jurisdictions. At the facility level, accreditation could include AMS elements such as a clinic policy or designated champion. Expanding CE and communication training would help practitioners manage client expectations and apply stewardship principles in practice. A minimum requirement for CE on this topic is another option.

5. Encourage Benchmarking and Data-Driven Improvement

Benchmarking was identified as a valuable tool for reflection and behaviour change. Non-punitive benchmarking at the clinic or individual level could highlight prescribing trends and motivate improvement. CVO could explore pilot programs in partnership with national data systems such as the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) or the Veterinary Antimicrobial Sales Reporting (VASR). Providing localized resistance data and case-based examples would further support evidence-based prescribing. Informal benchmarking tools, such as self-assessment checklists, could encourage low-stakes reflection.

6. Improve Client Communication and Public Education

Client expectations remain a major barrier but also a key opportunity. Veterinarians often feel pressured to prescribe to maintain satisfaction. Ready-to-use handouts, posters, and talking points would help explain when antibiotics are unnecessary and present alternative care options. Coordinated public campaigns from credible, non-commercial sources could reinforce consistent AMS messages and normalize responsible antibiotic use. Linking stewardship with preventive health measures such as vaccination and wellness would further engage clients and align their expectations with veterinary guidance.

7. Build Strategic Partnerships to Extend Impact

Progress in AMS will depend on collaboration among regulators, industry, academia, and government. Partnerships with the Ontario Veterinary College and the Ontario Veterinary Medical Association could expand AMS education for students and practitioners. Collaboration with the Ontario Ministry of Agriculture, Food, and Agribusiness and large-animal associations would help align companion and equine stewardship with broader provincial strategies.

Conclusion

The study confirmed and expanded on key factors influencing AMS adoption in veterinary practice, identifying both barriers and enablers through literature review, interviews, and focus groups. Findings highlight opportunities for the CVO to lead sustainable, collaborative AMS implementation by supporting clinic-level programs, stewardship champions, and professional education, while embedding AMS into standards, licensing, and public communication. Collectively, these strategies can help normalize AMS as a core element of veterinary professionalism, enabling responsible antimicrobial use while maintaining high standards of patient care and practitioner autonomy.

Introduction

Antimicrobial resistance (**AMR**) is a growing global threat that undermines the effectiveness of essential veterinary and human medical treatments. The way antimicrobials are used in animals plays an important role in the development and spread of resistance, which can have direct implications for animal health, public health, and the sustainability of veterinary practice. As the regulatory body responsible for licensing and overseeing veterinarians in the province, the College of Veterinarians of Ontario (**CVO**) is a critical stakeholder in promoting responsible antimicrobial use (**AMU**) and advancing antimicrobial stewardship (**AMS**).

Antimicrobial use refers to the administration of antimicrobial drugs such as antibiotics, antifungals, and antivirals to prevent or treat infections in animals. Understanding how and why these drugs are prescribed is essential to developing effective AMS strategies that balance the need for animal care with the goal of minimizing resistance.

The CVO is seeking to improve AMS within veterinary practice, particularly in the equine and companion animal sectors. To this end, ACER Consulting was commissioned to support the CVO in investigating the current prescribing practices and behaviours of veterinarians, focusing on the factors that influence their decision-making. While some literature exists on this topic, it is not extensively studied in an Ontario or Canadian context. What research is available often provides only limited insight into the realities of prescribing practices and the broader drivers influencing these behaviours.

To address these gaps, a multi-pronged approach was undertaken, including a literature review, key informant interviews with subject matter experts, and focus groups with practicing veterinarians in Ontario. Recognizing the need for a deeper understanding to guide their efforts, the CVO engaged ACER Consulting to lead a project that explores these issues in detail. Specifically, the project included:

1. **Literature and Key Informant Investigation**
   A comprehensive review of primary and grey literature, alongside consultations with key informants, to uncover trends, drivers, and realities influencing veterinary decision-making related to antimicrobial use and stewardship. This investigation provides a foundational understanding of the factors shaping prescribing practices.

2. **Focus Groups with Veterinarians**
   A series of focus groups with veterinarians from the equine and companion animal sectors to gather specific insights into the drivers and barriers to AMS. These discussions aimed to capture the on-the-ground realities faced by practitioners and provide nuanced feedback.

3. **Development of Recommendations**
   Synthesizing findings from the previous phases, ACER Consulting created a set of actionable recommendations for the CVO's Council. These recommendations are intended to inform the development of AMS strategies and potential accreditation requirements, ensuring alignment with national initiatives and the needs of Ontario veterinarians.

The goal of this report is to provide the background research necessary to guide the CVO on opportunities to develop strategic activities and priorities to address AMS within their regulatory scope. It may also support a deeper understanding and communication strategy that enables collaboration with other key partners in the sector, including veterinary associations and regulatory bodies across Canada.

Methods

Literature Review

The first component of the project involved a review of the available literature on factors driving AMU and AMS in veterinary clinics. This included a review of both primary and grey literature to identify trends and factors influencing prescribing and stewardship practices, with a focus on the equine and companion animal sectors where possible.

Primary literature was sourced through systematic searches of Google Scholar, Web of Science, and PubMed. A broader web-based search using Google was also conducted to capture relevant grey literature which includes reports and other documents of relevance to the project objectives that come from credible sources outside of academic journals. Search strategies combined terms such as "veterinary prescribing patterns," "prescribing behaviour," "antimicrobial use," "antimicrobial stewardship," "barriers," and "veterinarian decision-making." Only papers written in English were

included in the search and review. Research from North America was prioritized, with a particular focus on Canadian studies; however, literature from comparable jurisdictions such as Europe and Australia was also included when relevant to provide broader context and insights.

Key Informant Interviews

A series of key informant interviews were conducted in an effort to supplement the literature review by capturing real-world insights, uncovering gaps in the existing knowledge base, and identifying practical challenges and opportunities associated with AMS in veterinary practice. Particular attention was given to understanding the contextual drivers of antimicrobial use, including behavioural, economic, and regulatory factors.

A total of 8, 30–60-minute interviews were conducted with key informants. Informants were recruited via snowball sampling. An initial list of key informants was drafted with the CVO team and during those interviews, informants were asked to identify other key informants that should be included in the interviews. The final list of participants included:

- Herman Barkema – University of Calgary
- Richard Reid-Smith – Public Health Agency of Canada
- Carolee Carson – Public Health Agency of Canada
- Angie Boseman – Public Health Agency of Canada
- Catherine Belanger – Public Health Agency of Canada
- Phil Buote – Alberta Veterinary Medical Association
- John Prescott – University of Guelph
- Scott Weese – University of Guelph
- Alison Moore – Ontario Ministry of Agriculture, Food and Agribusiness
- Jane Parmley – University of Guelph
- David Patrick – British Columbia Centre for Disease Control

Interviews were conducted virtually over Zoom, and led by a member of the ACER Consulting team following a semi-structured discussion guide (**Appendix 1**). Another member of the ACER Consulting team was present to take detailed notes.

Focus Groups

A series of focus groups were also conducted to validate the literature review and interview findings and to capture experiences of practicing companion animal and equine veterinarians in Ontario. A total of 6 focus groups were completed; the focus groups were 90 minutes long and held virtually over Zoom. A facilitator and note taker were present from the ACER team for each group, and a recording was taken to aid in note taking. Focus groups ranged from 3-6 participants per session with a total of 26 participants. Four of the focus groups were held with companion animal veterinarians and 2 sessions had a mixture of equine veterinarians and companion animal veterinarians. Recruitment was done through an emailed recruitment message sent out to the CVO mailing list, which directed interested parties to a sign-up form collecting general availability and contact information. Participants were contacted via their submitted

contact information if their availability matched enough other participants to schedule a group. A small number of equine veterinarians were sent the recruitment email directly from publicly available contact information. This was done to ensure equine veterinarians were represented in the focus groups as there were not enough general sign-ups from the CVO mailing list to form a group. Focus groups followed a general discussion guide (**Appendix 2**). Following the conclusion of the focus groups, participants were each sent a $100 Amazon card as an honorarium for their participation.

Results

Literature Review

Antimicrobial Resistance and Stewardship in Veterinary Practice

Antimicrobial resistance is a global threat to both human and animal health, driven by complex evolutionary pressures and transmission dynamics that transcend species, cultures, and borders (Antimicrobial Resistance Collaborators, 2022). While much of the attention has focused on the human health implications of rising resistance, leading to increased awareness in human medicine about the need for judicious AMU and robust AMS practices, the role of AMU in food animal production has also come under scrutiny, primarily due to the large volumes of antimicrobials consumed, nontherapeutic use, and potential for residues in products for human consumption (Marshall & Levy, 2011). In contrast, companion animals have received comparatively little attention, despite their growing importance in the AMR landscape. Although their overall antibiotic consumption may be lower than in humans or livestock, companion animals are often treated with critically important antimicrobials, and resistant bacterial isolates have been identified in pets (Guardabassi & Prescott, 2015). Given their close contact with humans, companion animals represent a potentially significant but underappreciated factor in the broader challenge of AMR (Schwarz et al., 2017).

Despite growing recognition of the role that companion animals may play in the AMR ecosystem, surveillance efforts in this sector remain limited and fragmented. The Canadian Integrated Program for Antimicrobial Resistance Surveillance (**CIPARS**) is a program led by the Public Health Agency of Canada focused on integrating passive and active surveillance data from multiple sources focused on livestock but integrating other animal, plant, and human data where available and applicable (Government of Canada, 2025). The primary data sources used includes veterinary sales data, AMU data collected from sample farms, and AMR data collected from a variety of sources (Government of Canada, 2025). In their latest report, CIPARS reported that the quantity of medically important antimicrobials sold for use in animals (collected through veterinary sales data) has plateaued (Government of Canada, 2025). Integrated with human and plant data the distribution of total AMU was 78% for production animals, 19% for humans, 2% for plants/crops, and less than 1% for cats and dogs (Government of Canada, 2025).

In Canada, the Federal government has been active in developing frameworks to guide and support federal, provincial, territorial, and industry policies and activities for AMU. In 2015, the Federal

Framework on AMR and the Federal Action Plan on AMR were released, followed by the "Federal Action Plan on Antimicrobial Resistance and Use in Canada: Building on the Federal Framework for Action on Antimicrobial Resistance and Use in Canada" in March 2015. In August 2017, "Tackling Antimicrobial Resistance and Antimicrobial Use: A Pan-Canadian Framework for Action" was released, which outlined four components: (1) surveillance, (2) infection prevention and control, (3) stewardship, and (4) research and innovation. The aim was to demonstrate how Canada will collectively act on the issue of AMR. In June 2023, the Government of Canada released the Pan-Canadian Action Plan on Antimicrobial Resistance (**PCAP**), which provides a 5-year multi-jurisdictional and multi-sectoral roadmap for concerted action to address AMR. This action plan clearly highlights the need for a One Health response to AMR, outlining 10 priority actions to guide federal, provincial, and territorial governments' AMR efforts across 5 pillars: (1) research and innovation, (2) surveillance, (3) stewardship, (4) infection prevention and control, and (5) leadership.

Complementing the PCAP actions is a description of key partner roles and responsibilities. All levels of government are clearly identified as sharing a responsibility for human and animal health and welfare, food safety and the environment. The PCAP actions acknowledge and highlight the differentiating roles between differing levels of government. Furthermore, they identify the roles of a wide range of stakeholders, from professional associations and licensing bodies to human and animal health professionals, pharmaceutical industry, agriculture and agri-food industries, non-governmental organizations, and the environment and academic sectors.

The majority of these stakeholder organizations, including provincial veterinary organizations, describe an awareness of the growing threat of AMR and support action through encouraging education, surveillance, responsible stewardship, and research. Several organizations also underscore their public statements with the importance of AMR from a global One Health perspective as well. For example, the Canadian Veterinary Medical Association's (2021) position statement reads; "The Canadian Veterinary Medical Association (**CVMA**) strongly supports antimicrobial stewardship by veterinarians to help protect the health and welfare of animals, public health, and the environment."

One of the notable actions impacting antimicrobial use in veterinary medicine in Canada was the shift to making all medically important antimicrobials prescription only. In 2018, Health Canada added all medically important antimicrobials to the Prescription Drug List, thereby removing the ability to purchase these drugs without veterinary oversight (Government of Canada, 2018).

Antimicrobial stewardship is a broad term encompassing a range of actions and approaches that aim to preserve the efficacy of antibiotics and limit the impact of AMR (Hardefeldt et al., 2025). While AMU is multifaceted, AMS is even more complex, requiring consideration of the wider environmental context, the broader consequences of use, as well as all of the dimensions of AMU (Hardefeldt et al., 2025). A common framework for AMS is the "5Rs" approach, **Responsibility**, **Reduction**, **Refinement**, **Replacement**, and **Review** (Page et al., 2014). This model provides a concise overview of key principles for veterinarians: they should accept responsibility for antimicrobial use decisions; reduce use whenever possible; apply a refined approach by selecting the right drug, dose, timing, and duration; replace antimicrobials with effective and safe alternatives when available; and regularly review stewardship practices to support continuous improvement (Page et al., 2014).

An important component of adoption of AMS is behaviour change of practitioners. There are a number of frameworks that can be used to describe and understand the internal and external drivers to behaviour. One framework for understanding is the COM-B model (Capability, Opportunity, Motivation – Behaviour), which postulates that an individual's capability, opportunity, and motivation interact to manifest behaviour (Michie et al., 2011). This framework and basic understanding of the drivers of behaviour change is an important foundation for the idea of intervention; considering what areas of the model can be acted upon with a given intervention to achieve the desired behavioural change.

Influences and Barriers to Implementation of Antimicrobial Stewardship

A number of studies have examined the factors associated with the adoption of AMS principles in clinical practice and veterinarians' antimicrobial prescribing decisions. A summary of the influences and barriers to implementing antimicrobial stewardship are presented below, broadly sorted into intrapersonal, interpersonal, and external factors.

Intrapersonal Factors

These relate to individual veterinarians' knowledge, attitudes, and beliefs. For example:

- How relevant do veterinarians perceive AMS to be in companion animal or equine contexts?
- Have they received formal training in AMS?
- Do they feel confident in their understanding of stewardship principles?

A variety of cognitive and educational factors influence the adoption of AMS practices in companion animal veterinary medicine. One key motivator for change is the perception of impact; veterinarians' belief in the consequences of their own prescribing behaviour. A study in Australia found that while most veterinarians recognized that antimicrobial overuse is a widespread issue in veterinary medicine and believed that the profession as a whole has a responsibility to address it, many were less convinced that their individual actions significantly contributed to AMR (Hardefeldt et al., 2018). Additionally, Hopman et al. (2018) noted that veterinarians' antimicrobial prescribing decisions were strongly influenced by personal beliefs, habits, and past experiences rather than consistent adherence to evidence-based guidelines. While some recognized the importance of prudent antimicrobial use and its role in combating resistance, others downplayed the impact of companion animal prescribing on overall antimicrobial resistance, leading to wide variation in practices and attitudes (Hopman et al., 2018). This perceived lack of personal impact can dampen motivation to engage with stewardship efforts, even when broader awareness of the issue exists. Conversely, enhancing the sense of personal self-efficacy may be an effective strategy to increase AMS engagement.

Although focused on dairy practice, recent research offers insights that are also relevant to understanding intrapersonal influences on AMS across veterinary sectors. A Canadian study by Cobo-Angel et al. (2023) focused on dairy veterinarians found that prescribing behaviours were shaped by both individual and external factors, including education, experience, and personal responsibility for animal welfare. Veterinarians described balancing stewardship principles with practical and ethical pressures to safeguard animal health, often leading to tension between AMS ideals and welfare concerns

(Cobo-Angel et al., 2023). Younger veterinarians reported being more open to stewardship concepts and more aware of AMR risks, while more experienced practitioners tended to rely on established habits and clinical intuition (Cobo-Angel et al., 2023). These findings mirror trends in companion animal and equine medicine, where personal beliefs, professional identity, and perceived responsibility similarly influence how veterinarians interpret and apply AMS principles. This underscores that many of the cognitive and cultural barriers to stewardship adoption are shared across sectors, even when the practical settings differ.

Education is another critical factor influencing adoption. Continuing professional development is already widely acknowledged in veterinary medicine as essential for staying up to date with advancements in research and best practices. When targeted appropriately, educational interventions can lead to meaningful reductions in AMU, with some studies demonstrating sustained changes in prescribing behaviour over time (Singleton et al., 2021; Hopman et al., 2019). One study found decreased total antimicrobial use over the course of a year after participation in an antimicrobial stewardship programme in Denmark (Hopman et al., 2019). Another study comparing light and heavy intervention groups to a control group found that even the light intervention group, which received only educational information, showed a reduction in the prescription of high-importance antimicrobials for felines during the eight months following the intervention (Singleton et al., 2021). Those in the high intervention group, who received educational materials, benchmarking reports, and follow-up meetings, further reduced their use of high-importance antimicrobials in both feline and canine cases over the same period compared to the control population (Singleton et al., 2021).

The confidence of veterinary professionals in their own prescribing decisions, based on their knowledge and experience, has also been identified as a significant factor in AMU (Servia-Dopazo et al., 2021). These findings highlight the potential of education not only to fill knowledge gaps but also to incorporate new information and build confidence, reshaping attitudes and reinforcing stewardship-aligned behaviours.

However, significant barriers remain. Studies report knowledge gaps and limited familiarity with AMS guidelines, suggesting that some practitioners lack a clear understanding of the rationale for stewardship and how to apply it in clinical settings (Servia-Dopazo et al., 2021; Sun et al., 2023; Kovačević et al., 2020). These gaps are often rooted in veterinary education, where AMS is inconsistently integrated into curricula (Guardabassi & Prescott, 2015). Clinical training, in particular, often underemphasizes antimicrobial decision-making, and support staff who play a key role in implementing AMS protocols are frequently overlooked in educational efforts (Sun et al., 2023; Redding et al., 2023).

In addition to knowledge-based barriers, attitudes and beliefs among practitioners can also undermine stewardship adoption. This is often accompanied by a tendency toward “other-blaming” - attributing inappropriate AMU to client demands, poor owner compliance, or the behaviour of colleagues in other practices or sectors (Golding et al., 2019; McCubbin et al., 2023). These attitudes can reduce the sense of personal responsibility and act as psychological barriers to behaviour change. When combined with insufficient knowledge and inadequate training, these belief systems create a complex web of cultural and cognitive obstacles that hinder the development of a stewardship-oriented mindset within companion animal practice.

Interpersonal Factors

These include dynamics and communication with:

- **Clients:** Their expectations, understanding of AMR, concerns about cost, and perceived pressure for immediate solutions.
- **Clinic staff and colleagues:** The culture within the clinic, roles of support staff, and influence of senior team members on prescribing norms.
- **Peers:** Broader professional norms and shared experiences that shape behaviour

Interpersonal factors play a critical role in either supporting or hindering AMS in companion animal veterinary practice. One of the most consistently cited influences is the veterinarian–client-patient relationship. A systematic review found that client-related pressures, including actual or perceived expectations for antibiotics, lack of awareness about AMR, and concerns about cost, were key factors influencing prescribing behaviour (Servia-Dopazo et al., 2021). Veterinarians may feel compelled to prescribe antimicrobials, even when not clinically necessary, to avoid client dissatisfaction or to mitigate the risk of a poor outcome that could reflect negatively on their care (Hopman et al., 2018). This defensive prescribing, driven by fear of negative consequences, mirrors challenges observed in human healthcare and highlights the shared need across sectors to improve public understanding of appropriate AMU (Suttels et al., 2023; Servia-Dopazo et al., 2021).

Effective communication and trust-building between veterinarians and clients are key to overcoming these pressures. Studies show that shared decision-making and clear explanations of treatment plans can enhance client acceptance of stewardship-aligned practices (Frey et al., 2022; Currie et al., 2018). When clients feel heard, and understand the reasoning behind withholding antibiotics, they are more likely to support those decisions, reducing the likelihood of conflict and building long-term trust in the veterinarian–client-patient relationship (Smith et al., 2018).

Within veterinary teams, clinic culture and internal dynamics also influence AMS implementation. Hierarchical practice structures, coupled with time constraints, often limit the involvement of veterinary technicians and other support staff in stewardship activities, despite their crucial role in reinforcing prescribing decisions and educating clients (Redding et al., 2023). Additionally, studies report that senior veterinarians are influential to the prescribing decisions of less experienced veterinarians (Shano et al., 2024). When decision-making is concentrated among senior veterinarians, opportunities for a team-based approach to AMS may be missed. Conversely, clinics that foster inclusive environments and collaborative workflows are better positioned to embed stewardship into routine practice.

Finally, the influence of peers and broader professional norms should not be underestimated. Veterinarians' prescribing behaviours are often shaped by the shared practices and informal standards within their professional networks. Observing and discussing prescribing patterns with colleagues whether within the same clinic or through wider veterinary communities can reinforce either stewardship-supportive or counterproductive behaviours (Hopman et al., 2018). Encouraging open dialogue and knowledge exchange among peers has been shown to be a potential mechanism for supporting behaviour change related to prescribing in dairy veterinarians, and could offer similar benefits to companion animal and equine veterinarians (Pucken et al., 2019). Together, these

interpersonal dynamics form a powerful set of social factors that can either facilitate or undermine the adoption of antimicrobial stewardship in companion animal care.

External Factors

These are systemic or contextual elements that affect decision-making, such as:

- **Diagnostic limitations:** Availability, reliability, or confidence in diagnostic tools.
- **Lack of alternatives:** Limited options beyond antimicrobials, or insufficient access to up-to-date prescribing guidelines.
- **Time constraints:** The time required to implement stewardship practices during and outside of appointments.
- **Regulatory environment:** Policies and frameworks that shape how AMS is implemented or prioritized.

External factors also play a significant role in shaping how AMS is adopted in veterinary practices. A key enabler of evidence-based prescribing is access to reliable and cost-effective diagnostic tools, including microbiological testing and laboratory services. However, limited availability of these resources and/or insufficient access to timely results continues to be a major barrier (Norris et al., 2019). Without timely and affordable diagnostics, veterinarians often rely on empirical treatment, increasing the likelihood of unnecessary AMU (Hardefeldt et al., 2018; Lagana et al., 2023). Similarly, access to up-to-date prescribing guidelines and high-quality educational materials can support clinical decision-making, but these resources are not always well-integrated into daily workflows (Hardefeldt et al., 2022; Richards et al., 2023).

Time and cost constraints further complicate AMS implementation. The time required to conduct diagnostics, educate clients, or fully assess an animal during a busy clinical schedule can be prohibitive (Servia-Dopazo et al., 2021; Lagana et al., 2023). These pressures are especially acute in high-throughput practices where appointment durations are short and financial margins are tight. The lack of integrated AMS support mechanisms such as clinical decision tools or standardized protocols makes it difficult to incorporate AMS into routine workflows efficiently (Lagana et al., 2023; McCubbin et al., 2023). As a result, veterinarians may default to prescribing antimicrobials as a time-saving measure or out of a perceived obligation to act quickly in the face of diagnostic uncertainty.

Beyond time and diagnostics, prescribing decisions are also influenced by the availability and accessibility of appropriate antimicrobial agents and their alternatives. In some cases, limited formulation options, route of administration, or dosing challenges can restrict the veterinarian's ability to choose the most appropriate treatment (Odoi et al., 2021; Servia-Dopazo et al., 2021). In the absence of viable non-antimicrobial therapies, particularly for self-limiting conditions or where owner compliance is uncertain, antibiotics may be used as a default, even when not strictly necessary.

Finally, broader regulatory and policy frameworks can either support or undermine stewardship efforts. The presence of formal AMS policies, workplace governance structures, and a culture that prioritizes responsible AMU are all associated with improved implementation (King et al., 2018). Conversely, their absence contributes to inconsistent practices and limited accountability. National-level regulation, public

education campaigns, and policy-driven incentives or mandates have also been recognized as important contextual enablers that shape how AMS is prioritized and practiced across the profession (Currie et al., 2018; King et al., 2018). Defensive prescribing, in this context, may also be partly shaped by an unclear or underdeveloped regulatory environment that does not adequately support veterinarians in making conservative prescribing decisions.

Together, these factors form the systemic backdrop against which individual and interpersonal decisions are made. Addressing these contextual barriers is essential for creating a veterinary practice environment where AMS can be meaningfully implemented.

Key Informant Interviews

Current State of AMS in Veterinary Practice

Interviewees described the current state of AMS in veterinary practice as highly variable across species sectors and individual practices, with companion animal and equine medicine lagging significantly behind food animal sectors. It was felt that in companion animal and equine practice, AMS awareness and adoption remain limited, with antibiotics still commonly prescribed without sufficient diagnostic justification. In contrast, the food-producing animal sector was perceived to be more advanced, driven by industry oversight, economic pressures, and existing regulatory structures.

Equine practice was highlighted as presenting particularly unique challenges. Interviewees highlighted that while veterinarians are often cautious about prescribing antibiotics, especially due to risks such as colitis, inappropriate AMU persists, particularly in performance horse contexts. In high-stakes situations (e.g., racing), antibiotics are frequently used as a precaution or under pressure to ensure animals are fit to compete. Participants reported that diagnostic testing is not often undertaken due to economic constraints, time pressure, and owner/trainer expectations. Interviewees highlighted a lack of suitable diagnostic tools at the point of care, limited drug options, reliance on compounding pharmacies, and regulatory complications (e.g., positive drug test risks) as key contributors to suboptimal prescribing.

Several participants noted that while progress has been made in raising awareness over the past decade, particularly following Health Canada's 2018 regulatory changes, momentum has stalled. The federal or provincial leadership on veterinary AMS is viewed as limited. Further, communication and public engagement have declined since the initial post-regulatory push, leaving a gap in continued AMS messaging. The regulatory and policy landscape was widely seen as a missing piece in driving AMS forward. Participants expressed the need for stronger leadership from organizations like the CVO, CVMA, and provincial veterinary associations, as well as better alignment with human health AMS approaches. Several also noted that companion animal medicine remains under-prioritized in national policy and surveillance frameworks due to its relatively smaller share of antimicrobial use compared to livestock.

It was also commonly noted that there is limited integration of AMS principles into the broader veterinary team. While efforts to involve technicians and support staff in stewardship conversations were seen as promising, hierarchical clinic structures and time constraints often limit their participation.

Overall, respondents characterized the current state of veterinary AMS as inconsistent, under-resourced, and under-regulated, with significant room for improvement, particularly in the companion animal and equine sectors. While individual veterinarians and clinics may be making strides, there was a clear call by key informants for stronger system-level support, targeted communication, and continued innovation to move AMS forward across the profession.

Barriers to Stewardship Adoption

Interviewees identified a complex set of barriers to implementing AMS in veterinary settings, broadly agreeing with findings described above from the literature and expanding on how those factors interact with real world experience. Barriers range from knowledge gaps and cultural norms to economic pressures, systemic challenges, and regulatory limitations. These obstacles interact across clinical, organizational, and societal levels, making AMS uptake inconsistent and difficult to sustain.

Behavioural and Psychological Barriers

Interviewees report that many veterinarians see AMS as a low-priority issue compared to the immediate needs of the animal in front of them. Some express apathy about their individual impact, citing higher usage in other sectors or colleagues. Habits, time pressures, and clinic norms often shape prescribing more than evidence or protocols. There is also a lack of confidence in challenging client expectations or stepping away from routine prescribing patterns. Interviewees highlighted the need for stronger communication tools to support difficult client conversations, giving veterinarians the information and confidence to converse with clients on this topic. Finally, interviewees emphasized the importance of framing AMS within a harm-reduction approach to make it more approachable to practitioners. Framing the goal of stewardship actions as reducing harm from antimicrobial resistance as much as possible, not the elimination of antimicrobials.

Knowledge, Training, and Guidelines

Interviewees noted that in their experience, veterinarians often lack familiarity with AMS principles, antimicrobial classifications, and stewardship or treatment guidelines. Awareness and use of existing resources, such as those from the CVMA, World Organization for Animal Health (WOAH), and International Society for Companion Animal Infectious Diseases (ISCAID), were described as limited. AMS content is inconsistently taught across veterinary schools, and new graduates frequently enter practice without clear direction on how to apply stewardship principles in daily clinical decision-making. Outdated habits are sometimes reinforced by senior colleagues, and education on AMS rarely extends to the broader veterinary team, including technicians. Time constraints were also identified as a barrier, as the pace of clinical work leaves little opportunity for in-depth review of guidelines during the day. Some interviewees expressed concern that standardized protocols can “take the joy out of practice” or restrict clinical autonomy. Overall, participants emphasized the need for sector-specific, detailed, and accessible treatment protocols that support rather than constrain veterinary judgment.

Cost and Client Expectations

Cost was repeatedly cited by interviewees as a barrier both in terms of diagnostics (e.g., culture and sensitivity testing) and client willingness to pay. Participants reported that many clients expect immediate solutions, and some resist follow-up visits or additional testing, especially in repeat cases. There is also pressure to provide antibiotics for convenience or to meet perceived client expectations. It was noted that these dynamics can push veterinarians toward defensive prescribing, particularly in high-pressure sectors like equine performance medicine.

Data, Measurement, and Benchmarking

Participants noted that veterinarians generally lack access to information that would allow them to evaluate their own prescribing patterns or identify areas for improvement. Interviewees observed that while corporate practices may use electronic medical records to monitor use, most independent clinics likely do not. Additionally, it was noted that the current national system (Veterinary Antimicrobial Sales Reporting [VASR]) provides only high-level sales data and lacks detail on indications, dose, or duration. As one interviewee commented, "You can't manage what you don't measure."

Clinic Culture and Leadership

Overall, participants noted that many practices lack a formal AMS plan, and there is no standard requiring them to have one, unlike in areas such as safety management. Interviewees expressed a need for leadership from regulators and veterinary associations to set expectations and provide support for clinics looking to improve their stewardship practices. Participants noted that there can also be challenges present within an individual clinic's culture, such as; resistance to change from established practitioners, limited integration of the wider team (e.g., technicians, nurses) in decision-making, and low confidence among vets in making AMS decisions, particularly when client or peer pressure is present.

Regulatory Gaps

Finally, interviewees emphasized the absence of regulatory mandates or national targets as a major barrier. They noted that widescale existing AMS initiatives often lack deadlines, measurable goals, or enforcement and that companion animal medicine, in particular, remains underrepresented in national surveillance and policy. Several interviewees also expressed the need for greater investment in innovation (e.g., point-of-care diagnostics) to support stewardship. Some interviewees voiced concern that stewardship efforts are at times undermined by access to unregulated treatments, such as imported or herbal products. Finally, there was also recognition from participants that veterinary public health infrastructure is limited, with few roles or systems dedicated to stewardship, health promotion, or preventive care, presenting a barrier to greater coordination of these efforts.

Focus Groups

Validation of Findings

Focus group participants were given a pre-read document with a summary of the literature review and interview findings on the factors impacting the adoption of stewardship practices. They were also read a

brief summary at the beginning of the group. From there, they were asked how that summary compared to their experiences.

Across all six focus groups, participants expressed that the pre-read document and verbal summary closely reflected their own experiences in practice. The list was described as inclusive, thorough, and comprehensive. Participants agreed that the materials reflected the complexity of stewardship in real-world contexts, highlighting the mix of scientific, cultural, and economic pressures that shape decision-making.

Many participants reflected on how AMU and AMS awareness have evolved over their careers. Several noted that while they had learned about stewardship principles in school, the realities of daily practice quickly revealed tensions between what they want to do and what they are able to do. Others described a gradual culture shift toward more conscientious use, particularly among newer graduates or clinics that emphasize evidence-based practice. Some younger veterinarians described pushback or criticism from senior colleagues who continue to prescribe antibiotics, for instance, giving antibiotics "just in case" after surgery or at the first sign of fever. In contrast, others noted that working alongside like-minded colleagues who share stewardship values helps keep them on track and fosters a clinic culture that supports best practices. Peer-to-peer influence was repeatedly identified as a strong determinant of prescribing behaviour, both positively (sharing new guidelines, modeling alternatives) and negatively (pressure to conform to traditional approaches). Many veterinarians shared examples of personal or clinic-level changes reflecting improved stewardship, and said that seeing peers operate effectively without certain drugs, such as practices that no longer stock metronidazole, was powerful reinforcement that prudent restraint is achievable. Participants credited these shifts to: exposure to recent guidelines, peer modeling, and seeing positive outcomes without antibiotics. The role of clinic culture in sustaining these changes was repeatedly emphasized. Participants said environments that value open discussion, mutual support, and access to evidence-based tools (such as the *Firstline* app) are more likely to foster responsible antimicrobial use.

Another major area of discussion was the limited quality and accessibility of continuing education (**CE**) on antimicrobial use in Ontario. Many veterinarians described current CE opportunities as limited, with few high-quality or practical options focused on AMS. Some said they rely heavily on resources like the Canadian Academy of Veterinary Medicine (**CAVM**), Dr. Scott Weese's blog, or the *Firstline* app to stay current, but that this self-directed learning depends on individual motivation and chance exposure. Participants emphasized that formal CE requirements do not necessarily translate into improved stewardship knowledge, as veterinarians can fulfill hours with unrelated content. There was strong consensus that better access to practical, evidence-based CE particularly content relevant to first-line antimicrobial choices, diagnostic interpretation, and communication with clients would directly support improved AMS.

Despite changing attitudes, participants agreed that AMS often collides with economic and client-related constraints. Many veterinarians said they would love to do culture and sensitivity testing on every infection but that the cost per test is prohibitive for many clients. This leads to treatment often without diagnostic confirmation. Participants articulated the challenge of balancing best practice against financial reality, prescribing an antibiotic that is likely to work rather than risking failure and additional cost. Economic stress, both within clinics and among clients, was seen as intensifying pressure to do

something, even when the clinical benefit is uncertain. Client compliance was another concern as it related to: stopping antibiotics early when symptoms improve, reusing leftover medications, or misapplying treatments at home. Focus group participants also described inherited cases from other clinics where inappropriate antibiotic use had shaped client expectations, requiring time-consuming education to reset understanding. Despite these challenges, several participants said that transparent communication and education often yield positive responses from clients.

Participants also emphasized that there are differences across species and practice types. Though the factors influencing stewardship remain similar, the ways they play out and the weighting of the pressures are felt differently depending on the context. For example, participants reported more diagnostic limitations and owner cost sensitivity for exotics and wildlife. Equine practitioners reported environmental conditions, client expectations, and logistical barriers make AMS especially complex in their experience. Dirty barns, fly season, or emergency foaling situations can make delaying prescriptions for diagnostics impossible. Liability and reputation concern also weigh heavily in the equine field; participants reported that in their observations defensive prescribing remains common. Equine veterinarians also noted that client pressure from trainers or barn managers can also be felt keenly at times, with requests for specific drugs that they may have received in the past or from other practitioners. Despite these barriers, many equine veterinarians reported strong collaboration within evidence-based teams that support rational use, though they acknowledged that more fear-driven practice still exists in more competitive or high-stakes settings.

Several participants also contrasted prescribing cultures across countries. Veterinarians who trained or practiced abroad cited differences in regulation and norms, from the previous over-the-counter access to antibiotics in Mexico to ongoing widespread overuse in parts of India. These comparisons reinforced for them how stewardship practices are shaped by broader systems, regulation, and professional education.

Opportunities for the Advancement of Stewardship

Our review of the primary literature, in-depth key informant interviews with subject matter experts, and extensive consultation with practitioners through focus groups has yielded several opportunities to support the implementation and normalization of AMS in veterinary medicine, emphasizing education, leadership, policy development, and communication. These strategies could shift the profession toward more consistent stewardship practices without compromising patient care or practitioner autonomy. This section presents a synthesis of the data collected and our perspective on the opportunities present to enhance AMS in veterinary medicine in the companion animal and equine contexts.

Overall, there is strong support for the CVO, and national organizations (e.g., CVMA, CCVR), to take a more active and visible leadership role in stewardship. Interviewees emphasized that regulatory action

must be paired with support and education rather than top-down enforcement. Thoughtful, staged implementation is key to long-term adoption.

Developing a Veterinarian Recognition Program on AMS

Participants in the interviews and focus groups emphasized the need for a structured approach to AMS within veterinary practice; a program that is focused on recognition and support rather than compliance or punishment. Many agreed that stewardship should be framed as good medicine rather than regulatory compliance, supported by visible leadership from professional bodies and peer networks within clinics.

Relatedly, AMS efforts were seen to be most successful when championed at the clinic level. Interviewees noted that stewardship champions could be veterinarians, technicians, or other team members passionate about AMS. Champions can help embed AMS into daily decision-making, foster team-wide engagement, and act as liaisons for continuing education and internal audits making this a more integrated approach to change. Additionally, creating forums for AMS champions to share strategies and challenges was mentioned as a way to support consistency and motivation for this approach across practices.

Overall, veterinary leadership organizations have the opportunity to take an active role in promoting positive change and celebrating wins across the profession. This could include developing voluntary accreditation standards for AMS at the clinic-level or additional standards, beyond base quality assurance expectations, that would allow individuals or clinics that are interested in championing stewardship to step forward. This would potentially support the development of a recognition program through other veterinary leadership channels, whether at the individual or clinic level that highlights how veterinarians and clinics have successfully implemented AMS, reinforces best practices, and helps shift social norms toward stewardship excellence.

Using a recognition program could foster and enable clinic-level solutions by encouraging clinics to develop clinic-specific AMS policies grounded in evidence-based guidelines, while balancing real-world practicalities with best practices. These policies could be led and maintained by clinic AMS champions, who play a critical role in setting culture, taking accountability, and driving implementation, often with more direct influence than a central organization alone could achieve. The CVO could explore the opportunity to promote and support this model, potentially offering practical guidance, concrete examples, and resources that show clinics how to develop and sustain their own AMS initiatives. Eventually the presence of a clinic level policy, or designated stewardship representative could be made a routine expectation.

Also of high importance in this opportunity is the need for communication and shared learning. There are opportunities to use existing forums, both virtual and in-person, and potentially creating new ones to provide recognition, promote best practices, and facilitate the exchange of ideas. Partnering with other veterinary leadership groups also offers the opportunity to expand impact. Suggestions included initiatives that span the jurisdiction of multiple organizations, such as an “AMS Practitioner of the Month,” highlighting case examples, featuring testimonials, and celebrating AMS successes through real

people. These approaches were seen as powerful tools for motivation, normalization, and the ongoing development of a strong stewardship culture within the veterinary community.

Guiding Evidence-Based Decision-Making Through a Strategic Toolkit

Our results showed a strong consensus that veterinarians need clear, practical, and species-specific AMS guidelines. Participants described current resources as fragmented, inconsistent, or difficult to apply in daily practice. They called for concise, evidence-based protocols outlining first-, second-, and third-line options, supported by quick-reference tools or mobile apps. Greater awareness of existing resources, such as ISCAID, CVMA, and Worms and Germs, was viewed as an immediate opportunity. Participants also stressed that educational materials should be unbiased and easily accessible, ideally developed or endorsed by trusted institutions rather than commercial entities. A “case of the week” feature highlighting successful non-antibiotic treatments was suggested to promote peer learning and normalize alternative approaches.

Equine practitioners noted a particular lack of AMS guidance for their field, as existing American Association of Equine Practitioners (AAEP) resources are limited and diagnostic cultures are often cost-prohibitive. They emphasized the need for published equine-specific guidelines to clarify when high-importance antimicrobials like ceftiofur are appropriate. Similar gaps were reported in some areas of small animal and exotic practice areas. Participants also called for funding and research support to update antimicrobial breakpoints (measures of susceptibility and resistance to antibiotics) and to generate clinically relevant, easily interpretable evidence that can guide field decisions.

Overall, the opportunity exists for a toolkit of resources addressing these needs, and a central place bringing together relevant messages and resources (and linking to others). This provides a place that veterinarians can be directed to when it comes to developing AMS policies, making AMS decisions, and getting involved in CE. Existing websites like the Farmed Animal Antimicrobial Stewardship (FAAST) Initiative, which is geared to livestock veterinarians and farmers, present opportunities to integrate additional veterinarian focused resources.

Communicating AMS as a Professional Responsibility to Veterinarians

Many veterinarians framed AMS as a core ethical responsibility tied to their professional privilege to prescribe. Participants spoke about AMR as a pressing global health issue and expressed a sense of duty to act in the public’s best interest. However, some felt uncertain whether regulators would support them if clients challenged stewardship-based treatment decisions. They wanted clearer communication from the CVO that evidence-based AMS decisions are supported, even when outcomes differ from client expectations. A communication and awareness campaign aimed at veterinarians offers an opportunity to disseminate this and other key messages. The results of this report can be used to develop a strategic set of key messages focussed on addressing the barriers identified, to promote AMS as a whole. This would also be a natural action after the development of any resources on this topic, as recommended above.

Incorporating AMS Into Existing Expectations: Licensure, Accreditation, and Continuing Education

Several focus group participants suggested implementing mandatory, updated AMS training as part of license renewal, similar to requirements in other jurisdictions such as Spain, Alberta, and Newfoundland and Labrador. The goal is to ensure consistent standards across the profession and encourage ongoing engagement with best practices. A short AMS learning module integrated into the license renewal process was proposed as a practical way to achieve this. This could also be achieved through evaluation at the facility level, when accrediting facilities. A component of facility assessment could be the presence of an AMS plan, a clinic champion or an individual accountable for the clinic's stewardship policies, and/or the use of evidence-based guidelines.

Participants broadly agreed that veterinary teams require more accessible and tailored AMS education. Key needs identified include brief, practice-relevant resources that fit seamlessly into daily workflows, rather than requiring extensive off-hours study. Training in client communication was highlighted as essential to support "no antibiotic" decisions and reduce defensive prescribing. Participants also emphasized the importance of clinic-wide education, ensuring that all team members are informed and aligned, and of CE that promotes active learning through self-assessment or scenario-based modules rather than passive lectures. Many noted that CE can be expensive and time-consuming, highlighting the importance of subsidized or freely available training. Journal clubs, in-hospital discussions, and peer mentorship were also recognized as useful methods for translating evidence into daily practice. In addition to providing opportunities for CE, mandating a minimum requirement of CE on key topics of importance such as AMS should be considered.

Benchmarking

Interviewees also discussed the value of benchmarking to drive reflection and behaviour change. Benchmarking at the clinic or individual level, without naming or penalizing, could highlight areas for improvement and encourage reflection but was acknowledged to have many logistical barriers to data harmonization and implementation. Consider developing a pilot project to explore how to do this well, or leveraging existing centrally collected information through programs like CIPARS and VASR, to inform how to do this.

Access to other data like localized resistance data and case-based prescribing examples were alternative options suggested to help practitioners align decisions with evidence. Participants also emphasized that comparative feedback, when presented supportively, could foster accountability and professional pride in improved prescribing practices. Offering opportunities for informal benchmarking through practical case studies could allow practitioners to compare their approach with examples of best practice in a low-stakes, reflective way.

Client Education and Communication

Participants agreed that effective AMS must extend to client communication. They highlighted the challenge of explaining why an antibiotic is not necessary, especially under time constraints or client pressure. Practical, ready-to-use tools like handouts were seen as valuable aids. Veterinarians suggested that public-facing materials from credible, non-commercial sources would help reinforce their

messaging. They also recommended educational posters in clinics, similar to those used in human medicine, to set expectations and normalize stewardship-aligned care.

Client expectations were consistently identified as a major barrier to implementing AMS, but also as an important opportunity for progress. Interviewees emphasized the need for clear, evidence-based public messaging campaigns to help pet and animal owners understand when antibiotics may not be necessary, and to introduce them to viable alternatives. Improved, consistent communication from regulators and professional associations would also help reduce mixed messaging and empower veterinarians during difficult client conversations. Beyond antibiotics, interviewees saw potential to engage clients around preventive care, such as vaccination, nutrition, and general wellness, positioning these practices as aligned with stewardship goals.

Developing Strategic Partnerships to Go Further Together

Industry partners were identified as both a potential resource and a challenge for AMS promotion. Participants noted that pharmaceutical representatives often provide CE opportunities but may focus on product promotion rather than stewardship principles. They suggested encouraging companies to include AMS messages in their educational outreach and to highlight appropriate use and alternatives. Collaboration with diagnostic laboratories was also viewed as an opportunity, particularly if it could help lower the cost of cultures and other diagnostic testing. Participants called for industry and regulators to work together to ensure AMS information is accessible, unbiased, and affordable. Furthermore, there are opportunities to work with the Ontario Veterinary College and other educational bodies to support the education of new veterinarians, veterinary technicians, and assistants with a focus on AMS. Similar opportunities for engagement with practicing veterinarians and veterinary technicians may exist with the Ontario Veterinary Medical Association and Ontario Association of Veterinary Technicians. Strategic opportunities on the equine and large animal side may also be present through the Ontario Ministry of Agriculture, Food and Agribusiness, and/or some of the large animal associations.

Conclusion

In conclusion, the key factors influencing the adoption of AMS practices identified in our literature review were confirmed and expanded through key informant interviews and validated by focus groups with practicing veterinarians in Ontario. This understanding of the barriers and enablers to AMS adoption informed several opportunities for the CVO to strengthen its leadership and support for stewardship within the profession.

Participants emphasized that sustainable change depends on visible, collaborative leadership from regulatory and professional bodies (e.g., CVO, CVMA, CCVR) and on supportive, phased implementation rather than top-down enforcement. Key opportunities include establishing auditable, clinic-level stewardship programs and recognition systems; promoting clear, species-specific information; and embedding AMS within professional standards and continuing education. Clinic-level “stewardship

champions" were identified as important drivers of culture change, and can be supported by peer networks and accessible training resources. Self-auditing, benchmarking, and integrating AMS education into license renewal were also highlighted as ways to promote consistency and accountability across the profession. Strengthening client communication and public awareness was viewed as essential, with calls for credible, evidence-based messaging and tools to support veterinarians in communicating about stewardship-aligned decision-making.

Collectively, these strategies can help normalize AMS as a core element of veterinary professionalism, enabling responsible antimicrobial use while maintaining high standards of patient care and practitioner autonomy.

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Appendix 1: Interview Discussion Guide

Questions and Probes	What Will Be Explored
How would you describe the current state of AMS in veterinary practice? ***Probe:*** • *Probe by species group (companion, equine, large) if they have perspective on that* • What are we doing well? • What do you see as common areas that need to be improved?	*The current stewardship picture, priority issues*
What are the barriers to getting veterinarians to put AMS into practice? ***Probe:*** • *Intrapersonal barriers (knowledge, attitude, etc.)* • *Interpersonal barriers (peers, clients, etc.)* • Are there important differences between species? • How important is clinic culture/clinic-level norms?	*Barriers in current context*
Where are the areas of opportunity here? How do we motivate a sustained change in AMS among Canadian veterinarians? ***Probe:*** • *Programs, policies, guidelines/protocols, regulations, tools, other resources* • What role do you think regulators like the CVO should play in shaping antimicrobial use in veterinary medicine?	
What does the ideal picture of AMS in veterinary practice look like to you? ***Follow-up:*** • What would need to be in place already to facilitate that future? • If resources weren't a concern, what strategies would you like to see implemented to motivate change? • Can we learn anything from strategies/policies/programs that have been put in place in human medicine?	
Who should we talk to for more info? Materials or resources for us to look at?	*Snowball sampling and additional resources*

Appendix 2: Focus Group Pre-Read and Discussion Guide

Introduction

Thank you for your interest in participating in a focus group. This short pre-read is designed to give you a brief overview of the goals of the session and highlight some key themes and discussion points that we'll be exploring together.

A brief summary of the insights gathered so far through literature reviews and interviews is included below to help frame the conversation. You'll also find a list of the discussion questions that will guide the session.

Goals and Objectives of the Focus Group

- **Validate existing findings** from literature and interviews about what drives or challenges antimicrobial stewardship (AMS) in veterinary practice in Ontario.
- **Explore the real-world experiences** of veterinarians in companion animal and equine medicine regarding AMS.
- **Identify opportunities and barriers** to improving stewardship in practice.

Summary of Preliminary Findings

From our research and interviews, several key factors emerged that influence antimicrobial prescribing and stewardship efforts. These fall into three broad categories:

1. Intrapersonal Factors

These relate to individual veterinarians' knowledge, attitudes, and beliefs. For example:

- How relevant do veterinarians perceive AMS to be in companion animal or equine contexts?
- Have they received formal training in AMS?
- Do they feel confident in their understanding of stewardship principles?

2. Interpersonal Factors

These include dynamics and communication with:

- Clients: Their expectations, understanding of antimicrobial resistance (AMR), concerns about cost, and perceived pressure for immediate solutions.
- Clinic staff and colleagues: The culture within the clinic, roles of support staff, and influence of senior team members on prescribing norms.

- Peers: Broader professional norms and shared experiences that shape behaviour.

3. External Factors

These are systemic or contextual elements that affect decision-making, such as:

- Diagnostic limitations: Availability, reliability, or confidence in diagnostic tools.
- Lack of alternatives: Limited options beyond antimicrobials, or insufficient access to up-to-date prescribing guidelines.
- Time constraints: The time required to implement stewardship practices during and outside of appointments.
- Regulatory environment: Policies and frameworks that shape how AMS is implemented or prioritized.

Main Discussion Questions

1. How do the things we found compare to your experiences?
2. Where are the biggest opportunities to enhance stewardship in veterinary practice?
3. What are some ways to motivate sustained change in prescribing practices and antimicrobial use among veterinarians?
4. How can regulators and industry bodies support stewardship?

Questions and Probes
Introductions • How long in practice? • General location? • Species focus?
Brief presentation/review of key takeaways about the state of AMS in practice and some of the influences and barriers to putting AMS into practice from literature and interviews.

How does this compare to what you've seen or experienced?
 	
Probes:
• *Intrapersonal factors (knowledge, attitude, beliefs etc.)*
• *Interpersonal factors (colleagues, peer norms,* ***client expectations****, etc.)*
• *External (time pressures, economic constraints, drug access, etc.)*
• Thinking of your own decision-making process for prescribing, are there any other factors that influence whether or not you prescribe antimicrobials?
• Are there important differences between species?
• How important is clinic culture/clinic-level norms?
  ○ Leadership/seniority role in promoting or hindering AMS
  ○ Whole team involvement

Optional: Beyond what we've discussed are there any other factors that make stewardship practices difficult to implement in your setting?
Where are the biggest opportunities to enhance stewardship in veterinary practice? ***Probe:*** • What types of support, resources, or feedback would help?
What are some ways to motivate sustained change in prescribing practices and antimicrobial use among veterinarians? ***Probe:*** • Are there technologies or decision-support tools that could make stewardship easier?
How can regulators and industry bodies support stewardship? ***Probes:*** • Should they help with tracking, benchmarking, or public communication? • Is there a role for AMS-related professional recognition or certification?