VET

Veterinary Emerging Topics (VET)™ Report

A Feline Focus on Antimicrobial Usage

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NAVC® The North American Veterinary Community

Banfield® PET HOSPITAL

We are pleased to share the second annual Banfield Veterinary Emerging Topics (VET)™ Report—a collaborative effort between Banfield Pet Hospital and the North American Veterinary Community (NAVC).

As the world's largest veterinary practice, Banfield is committed to using its size, scale and data to improve veterinary care for pets through evidence-based insights. NAVC is dedicated to advancing veterinary healthcare through education, collaboration and innovation by providing world-class continuing professional development and support services for the global veterinary healthcare community.

Joining forces on the VET Report allows our two organizations to draw on our strengths to maximize the VET Report's reach and impact.

Our focus this year is a continuation of last year's topic, which advanced the discussion on antimicrobial resistance in companion animal practice. We know that antimicrobial resistance is a growing threat to public health and that companion animal practitioners have an important role to play in the responsible stewardship of these powerful and important drugs.

Our 2017 publication reported on the 2015 AVMA Task Force for Antimicrobial Stewardship in Companion Animal Practice findings that although most companion animal practitioners felt that antimicrobial resistance was an important issue, the majority were unaware that antimicrobial use guidelines exist. We explored how this lack of awareness was reflected in antimicrobial prescription patterns among companion animal veterinarians for treatment of canine patients. By investigating current usage patterns, we sought to provide a baseline measure by which we can gauge the success of our profession in addressing the issue.

This year, we dove deeper into the topic to focus specifically on prescription patterns for treatment of common feline infections. Unsurprisingly, given the additional challenges associated with treating cats and ensuring compliance with prescribed treatment plans, we found that there is tremendous room for improvement with regard to antimicrobial use in cats.

We hope the 2018 VET Report motivates you to learn more about antimicrobial resistance and understand some of the underlying reasons for low concordance with the guidelines—we also hope it helps you identify opportunities for improvement in your own companion animal practice. Being proactive and mindful about using antimicrobial drugs judiciously when deciding on treatment plans can make a big difference in this critical and growing public health issue. Thank you for reading.

Respectfully,

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INTRODUCTION

Antimicrobial drugs are critical to the provision of veterinary care. Targeted antimicrobial administration is clinically indicated for many types of bacterial infections. However, with the rise of antimicrobial resistance, the judicious use of antimicrobial drugs in human and veterinary medicine is of crucial importance to avoid a loss of antimicrobial efficacy and mitigate development of multi-drug resistant bacterial strains.

In 2017, the Veterinary Emerging Topics (VET)™ Report focused on antimicrobial usage in companion animal practice. Usage patterns for antimicrobial treatment of common canine infections were compared with guidelines developed by the Antimicrobial Guidelines Working Group of the International Society for Companion Animal Infectious Disease (ISCAID).[1,2] Given low awareness of the guidelines among companion animal veterinarians in North America (12%)[3], a high degree of concordance was not expected. However, the resulting baseline data provided information about antimicrobial usage that can inform planning and evaluation of quality improvement efforts to promote judicious use of antimicrobial drugs.

Canine and feline patients have different bacterial infection patterns and may have behavioral factors that impact the frequency and nature of veterinary visits and resultant pharmaceutical choices. It is important to evaluate usage patterns for antimicrobial treatments of common feline infections to better understand differences from canine usage patterns.

This year, usage patterns for antimicrobial treatment of feline respiratory tract (RTI) and lower urinary tract infections (UTI) were investigated. Additionally, Banfield veterinarians were surveyed about factors that influence antimicrobial treatment decisions for feline patients.

METHODS

› Review of Patient Records of Antimicrobial Usage

For a complete description of materials, methods and statistical analysis, please refer to **Banfield.com/2018VETreport**. In brief, a retrospective analysis was performed with all cats evaluated at any Banfield hospital in the United States between January 2016 and December 2016 considered for inclusion. Individual visits were selected for inclusion if the cat received a diagnostic code indicative of one of the two conditions (RTI or UTI) and was administered an antimicrobial in-hospital or prescribed an antimicrobial from the hospital pharmacy within 14 days following the visit. Episodes in which a single antimicrobial was dispensed were analyzed for concordance with first-line treatment ISCAID guidelines.

Antimicrobial prescription instructions were unavailable as structured data. A utilization snapshot was obtained by conducting a manual review of the free-text medical notes from a random sample of 1,750 total visits (1,000 for RTIs and 750 for UTIs).

› Survey of Veterinary Professionals on Antimicrobial Use

An online[a] sample survey of Banfield practitioners was conducted in an effort to further understand factors that influence antimicrobial treatment decisions for feline RTIs and UTIs and perceived barriers to concordance with usage guidelines. Survey recipients included a geographically diverse group of 56 veterinarians, who comprise a group of recognized veterinary opinion leaders from Banfield hospitals.

RESULTS

› Antimicrobial Use in Feline Urinary Tract Infections

There were 22,667 feline UTI episodes diagnosed at Banfield hospitals in 2016. Of these, 17,442 were prescribed a single antimicrobial, 1,711 were prescribed multiple antimicrobials and 3,514 were not prescribed antimicrobials. Among episodes that received a prescription for a single antimicrobial treatment, 59% were classified as positive for urine bacteria based on in-house urinalysis (urine dipstick and sediment examination); 18% were classified as negative for urine bacteria. Twenty-three percent of felines diagnosed with a bacterial UTI did not have a urinalysis on file during the time of the episode (Figure 1). Culture and susceptibility (C&S) testing was completed for 1,299 samples of various collection modalities, 372 (29%) of which were positive for bacteria, with 420 isolates (Table 1). Table 2 lists the antibiotics prescribed as single agent therapy for feline UTIs.

Figure 1 – Treatment patterns for cats presenting with lower urinary tract signs

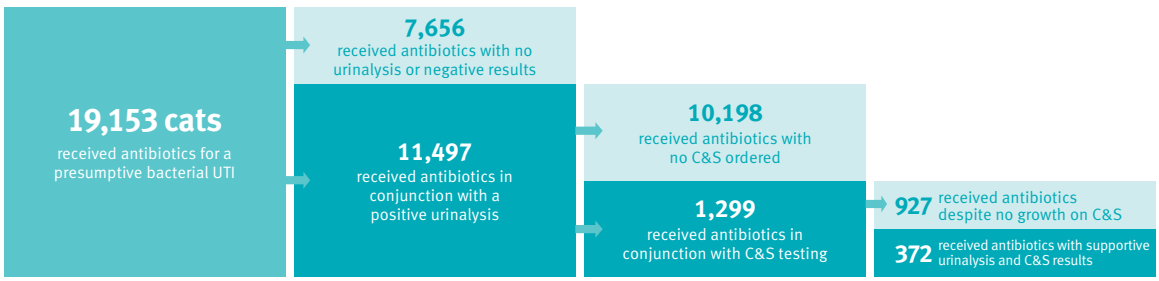

Table 1 – Urine Culture Bacterial Populations

Bacterial Species	Isolates
	n (%)
Escherichia coli	243 (57.9%)
Enterococcus species	117 (27.9%)
Coagulase-Negative *Staph* spp.	25 (6.0%)
Staphylococcus pseudintermedius	13 (3.1%)
Proteus mirabilis	10 (2.4%)
Staph Schleiferi subsp. *coagulans*	4 (1.0%)
Klebsiella pneumoniae	4 (1.0%)
Enterobacter cloacae	4 (1.0%)
Total	**420**

Table 2 – Frequency of single agent antimicrobials prescribed for feline UTIs by infection recurrence

Antimicrobial	Diagnosis	
	Nonrecurrent UTI	Recurrent UTI
	n (%)	n (%)
Cephalosporins (1st generation)	**30 (0.2%)**	**1 (0.2%)**
Cefadroxil	24 (0.1%)	0 (0.0%)
Cefazolin	6 (0.0%)	1 (0.2%)
Cephalosporins (3rd generation)	**8727 (51.6%)**	**269 (51.6%)**
Cefovecin	8672 (51.3%)	266 (51.0%)
Cefpodoxime	55 (0.3%)	3 (0.6%)
Fluoroquinolones	**1141 (6.7%)**	**83 (15.9%)**
Enrofloxacin	8 (0.0%)	0 (0.0%)
Marbofloxacin	750 (4.4%)	67 (12.9%)
Orbifloxacin	383 (2.3%)	16 (3.1%)
Lincosamides	**57 (0.3%)**	**2 (0.4%)**
Clindamycin	57 (0.3%)	2 (0.4%)
Macrolides	**9 (0.1%)**	**0 (0.0%)**
Azithromycin	9 (0.1%)	0 (0.0%)
Nitroimidazoles	**20 (0.1%)**	**2 (0.4%)**
Metronidazole	20 (0.1%)	2 (0.4%)
Penicillins	**6908 (40.8%)**	**161 (30.9%)**
Amoxicillin	430 (2.5%)*	12 (2.3%)*
Amoxicillin-clavulanate	6463 (38.2%)**	149 (28.6%)**
Ampicillin	15 (0.1%)	0 (0.0%)
Sulfonamides	**11 (0.1%)**	**1 (0.2%)**
Sulfadimethoxine	2 (0.0%)	0 (0.0%)
Sulfamethoxazole/Trimethoprim	9 (0.1%)*	1 (0.2%)*
Tetracyclines	**18 (0.1%)**	**2 (0.4%)**
Doxycycline	18 (0.1%)	2 (0.4%)
Total	**16921**	**521**

* Guideline concordant
** Acceptable, but not recommended

Antimicrobial classes evaluated included aminoglycosides, cephalosporins, fluoroquinolones , lincosamides, macrolides, nitroimidazoles, penicillins, sulfonamides and tetracyclines.

Of the feline UTI episodes that were treated with a single antimicrobial, 97% were determined to be nonrecurrent. Based on ISCAID's current treatment guidelines (Table 3), only 3% of nonrecurrent UTI episodes received a guideline-concordant antimicrobial. This increased to 41% if amoxicillin-clavulanate is considered an acceptable (not recommended) option (Table 3). For recurrent infections, 2% of episodes received a guideline-concordant drug, increasing to 31% if amoxicillin-clavulanate is considered concordant.

Table 3 – ISCAID recommendations for first-line antimicrobial treatment of feline UTIs[1]

Infection Type	First-Line Drug Options	Dosage	Frequency	Duration
Non-recurrent UTI (< 3 episodes of UTI in a 12-month period)	Amoxicillin	11–15 mg/kg	q8h	7 days
	Trimethoprim-sulfonamide	15 mg/kg	q12h	7 days
	Amoxicillin-clavulanate (acceptable but not recommended)	12.5–25 mg/kg	q8h	7 days
Recurrent UTI (≥ 3 episodes of UTI in a 12-month period)	*Guided by culture and antimicrobial susceptibility testing, but consider:*			
	Amoxicillin	11–15 mg/kg	q8h	4 weeks
	Trimethoprim-sulfonamide	15 mg/kg	q12h	4 weeks

The utilization snapshot of dosage, frequency and duration found that 54% of the reviewed prescriptions for amoxicillin treatment of UTIs were concordant with the ISCAID recommended dosage, 10% with the recommended frequency and 10% with the recommended duration. For amoxicillin-clavulanate, 69% of reviewed prescriptions were concordant with the recommended dosage, 0% with the recommended frequency and 24% with the recommended duration. ISCAID recommends q 8h dosing for amoxicillin and amoxicillin-clavulanate; this is considered to be uncommonly prescribed by veterinarians due to constraints around q 8h dosing and existing (published) q 12h dosing strategies.

From the practitioner survey, respondents' drug preferences for treatment of feline UTIs closely resembled findings from the Banfield medical records database. The most commonly prescribed antimicrobials for treatment of nonrecurrent UTIs were cefovecin (45%) or amoxicillin-clavulanate (43%). For treatment of recurrent UTIs, amoxicillin-clavulanate (24%), orbifloxacin (17%), cefovecin (14%) or marbofloxacin (14%) were most commonly prescribed.

› Antimicrobial Use in Feline Respiratory Tract Infections

There were 40,439 episodes of feline RTI diagnosed at Banfield hospitals in 2016, of which 24,628 were prescribed a single antimicrobial, 2,526 were prescribed multiple antimicrobials and 13,285 were not prescribed antimicrobials. Among the RTI episodes that received only a single antimicrobial, 99% were classified as upper respiratory tract infections (URIs) and 1% as bacterial bronchitis. Due to limitations in the database, the number of respiratory samples submitted for C&S could not be accurately determined. Table 4 lists the antibiotics prescribed as single agent therapy for feline RTIs.

Table 4 – Frequency of single-agent antimicrobials prescribed for feline RTIs by diagnosis

Antimicrobial	Diagnosis	
	URI	Bacterial Bronchitis
	n (%)	n (%)
Aminoglycosides	**3 (0.0%)**	**0 (0.0%)**
Gentamicin*	3 (0.0%)	0 (0.0%)
Cephalosporins (1st generation)	**40 (0.2%)**	**1 (0.3%)**
Cefadroxil	28 (0.1%)	0 (0.0%)
Cefazolin	12 (0.1%)	1 (0.3%)
Cephalosporins (3rd generation)	**6875 (28.3%)**	**131 (43.4%)**
Cefovecin	6856 (28.2%)	131 (43.3%)
Cefpodoxime	18 (0.1%)	0 (0.0%)
Ceftazidime	1 (0.0%)	0 (0.0%)
Fluoroquinolones	**462 (1.9%)**	**17 (5.6%)**
Enrofloxacin	19 (0.1%)	0 (0.0%)
Marbofloxacin	213 (0.9%)	13 (4.3%)
Orbifloxacin	230 (0.9%)	4 (1.3%)
Lincosamides	**307 (1.3%)**	**5 (1.7%)**
Clindamycin	307 (1.3%)	5 (1.7%)
Macrolides	**891 (3.7%)**	**8 (2.6%)**
Azithromycin	891 (3.7%)	8 (2.6%)
Nitroimidazoles	**103 (0.4%)**	**1 (0.3%)**
Metronidazole	103 (0.4%)	1 (0.3%)
Penicillins	**14633 (60.2%)**	**118 (39.1%)**
Amoxicillin	715 (2.9%)*	8 (2.6%)
Amoxicillin-clavulanate	13900 (57.1%)	110 (36.4%)
Ampicillin	18 (0.1%)	0 (0.0%)
Sulfonamides	**98 (0.4%)**	**0 (0.0%)**
Sulfadimethoxine	97 (0.4%)	0 (0.0%)
Sulfamethoxazole/Trimethoprim	1 (0.0%)	0 (0.0%)
Tetracyclines	**914 (3.8%)**	**21(7.0%)**
Doxycycline	914 (3.8%)*	21 (7.0%)*
Total	**24326**	**302**

* Guideline concordant

Antimicrobial classes evaluated included aminoglycosides, cephalosporins, fluoroquinolones, lincosamides, macrolides, nitroimidazoles, penicillins, sulfonamides and tetracyclines.

Based on current ISCAID guidelines for antimicrobial treatment of respiratory tract disease (Table 5), 7% of URI and 7% of bacterial bronchitis episodes were treated with a guideline-concordant antimicrobial.

Table 5 – ISCAID recommendations for first-line antimicrobial treatment of feline bacterial RTIs[2]

Infection Type	First-Line Drug Options	Dosage	Frequency	Duration	Reviewers in Agreement
Acute bacterial URI	*Recommended 10-day observation period prior to antimicrobial treatment unless fever, lethargy or anorexia is present with mucopurulent nasal discharge*				
	Doxycycline	5 mg/kg	q12h	7-10 days	16/17
		10 mg/kg	q24h		
	Amoxicillin (if *C. felis* and *Mycoplasma* are not strongly suspected)	22 mg/kg	q12h	7-10 days	16/17
Bacterial Bronchitis	*Guided by culture and antimicrobial susceptibility testing, but if clinical disease is severe consider while waiting for results:*				
	Doxycycline	5 mg/kg	q12h	Administer while waiting for C&S	16/17
		10 mg/kg	q24h		

The utilization snapshot of dosage, frequency and duration found that 34% of the reviewed prescriptions for doxycycline treatment of RTIs were concordant with the ISCAID recommended dosage, 99% with the recommended frequency and 47% with the recommended duration. For amoxicillin, 2% of reviewed prescriptions were concordant with the recommended dosage, 86% with the recommended frequency and 58% with the recommended duration.

The practitioner survey revealed that for RTIs, the most commonly dispensed antimicrobials for both feline URI and bacterial bronchitis were amoxicillin-clavulanate (46% vs 37% respectively), doxycycline (20% vs 24%) or cefovecin (17% vs 17%).

› Factors That Influence Antimicrobial Treatment Decisions

To further explore the rationale behind these usage patterns, Banfield veterinarians were surveyed about their antimicrobial treatment decisions.

Forty-two of the 56 (75%) eligible respondents completed the online survey. Due to the anonymous nature of the responses, demographic information about respondents was not available.

Respondents indicated their primary considerations for nonrecurrent UTIs were owner compliance (45%), availability of the drug in a preferred form of administration (43%) and pet compliance (41%). For recurrent UTIs, primary considerations were C&S testing results (71%), past experience (43%) and availability of the drug in a preferred form of administration (33%). Injectable drugs were the preferred form of administration for treatment of feline UTIs for 71% of respondents. Owner compliance (86%), ease of administration (74%) and pet compliance (69%) were the main drivers of this preference.

For URIs and bacterial bronchitis, the main drivers of the preferred drug were past experience (49% vs 51% respectively), knowledge/awareness of antimicrobial resistance or guidelines (37% vs 32%), availability of the drug in a preferred form of administration (44% vs 29%) and anecdotal evidence (29% vs 29%). In contrast to UTIs, liquid medications were the preferred form of administration for feline RTIs (59% of respondents). Owner compliance (81%), ease of administration (78%) and pet compliance (71%) were the main drivers.

DISCUSSION

› The Problem: Compliance and Adherence

Usage patterns for antimicrobial treatment of feline RTIs and UTIs had low concordance with ISCAID treatment guidelines. A survey of general practice veterinarians found client and patient compliance to be primary considerations when selecting an antimicrobial for treatment of feline patients, with perceived ease of compliance being driven primarily by drug form and resultant ease of administration.

The opportunities for our profession to exercise greater influence on the judicious use of antimicrobials warrants a discussion on compliance and adherence, and ways in which we can promote both to practice in concordance with antimicrobial guidelines when clinically indicated.

Compliance has been defined as "the extent to which pets receive a treatment, screening or procedure in accordance with accepted veterinary health care practices. Compliance involves both veterinary staff performing and/or recommending treatments, screenings and procedures and pet owner follow-through."[4] In contrast, adherence is defined as "the extent to which patients take medications prescribed, involving the pet owner in filling and refilling the prescription; administering the correct dose, timing and use; and completing the prescribed course."[4]

Judicious use of antimicrobials starts with compliance at the veterinary clinic. To be in compliance with accepted or desired health care practices, the veterinary staff must be aware of the desired practice. One key barrier to compliance with antimicrobial usage guidelines is awareness. A 2015 American Veterinary Medical Association (AVMA) survey demonstrated that 88% of companion animal practitioners were unaware of the existence of the ISCAID guidelines, despite the fact that 82% of respondents indicated that they were somewhat or strongly concerned about antimicrobial resistant infections in dogs and cats.[3] Veterinarians in today's landscape are barraged with information regarding medical knowledge and it can be almost impossible to stay current in every aspect of practice. While publication of the ISCAID guidelines in an open-source journal was an excellent first step in making them accessible for practitioners, there is an opportunity to make them even more visible, through repeated messaging, point-of-care availability or other means of promoting their existence.

The data reported here highlight several keys areas of discordance with ISCAID guidelines that warrant further exploration. While ISCAID guidelines represent the "ideal" and may not be appropriate in every clinical case, there are clearly opportunities to achieve improved concordance with guidelines and to carefully consider each case where the guidelines are not followed. Indeed, there was a relatively high rate of antimicrobial administration for urinary tract infections where no organisms were noted on sediment exam (18%) or a sediment exam was not performed (21%). There were a substantial number of cases in which organisms were identified on sediment exam but there was no bacterial growth on C&S (71%). Finally, a significant percentage of cases receiving antibiotics, almost 40%, had no urine testing done or the urinalysis was negative for bacteria.

The very low rate of C&S testing – less than 6% of nonrecurrent UTIs and 14% of recurrent UTIs – reflects an area of opportunity for companion animal veterinarians. There are numerous factors that can influence the likelihood of C&S testing, including financial cost relative to the cost of antimicrobials and turnaround time for results. However, these data highlight opportunities for practitioners to recommend C&S testing

whenever medically indicated and ensure that conversations with clients about C&S testing are conducted in a manner that educates on the topic of antimicrobial resistance. Figure 1 demonstrates that antimicrobial drugs are being used in cats with lower urinary tract signs far more frequently than is likely indicated based on the reported etiologic origins of the disease.[5] Given the low prevalence of bacterial infections in feline lower urinary tract disease, use of antimicrobial drugs should be carefully considered and employed only when truly indicated, and not as an initial treatment.

For respiratory tract infections, low concordance with the recommendation to use doxycycline highlights another opportunity. Survey respondents indicated that concerns over proper doxycycline administration and the potential for side effects (*e.g.*, esophageal stricture) have an influence on their antimicrobial choices. Compounded liquid forms of doxycycline are available, however certain flavor profiles (*e.g.*, berry) may be unappealing to cats. This is an opportunity for our profession to seek better treatment options for our patients, perhaps through conversations with pharmaceutical companies or licensed compounding pharmacies.

It is imperative that clients are educated about – and understand the importance of – owner and patient compliance with medical recommendations. Frank discussions about compliance, associated costs and risks of non-compliance can improve the quality of care provided and help reduce negative patient and public health outcomes. Presentation of the treatment plan is a crucial part of client education, and training the hospital team to carry out an effective and consistent conversation about recommendations is key. To effectively educate clients, hospital teams must understand the importance of diagnostic testing and adherence to treatment recommendations. Staff must be willing to converse with clients to understand potential resistance to recommendations and communicate this information to the veterinarian. Hospital teams must ensure that the client has an opportunity to ask questions, and questions should be answered to the client's satisfaction before agreeing on a diagnostic and/or treatment plan. Plans should be presented and recommended in entirety; options should be presented when medically indicated, but the primary decision-making responsibility for diagnostic and treatment recommendations lies with the veterinarian.

In a clinical setting, compliance and adherence influence clinical decisions. Survey respondents indicated that concerns about owner compliance frequently influenced their choice of medication. Guideline compliance, or lack thereof, was influenced by the medication's form of administration. Multiple respondents indicated that they prefer injectable to oral medications because of the perceived likelihood that an owner will be unable or unwilling to administer a complete course of oral antimicrobials. Financial concerns are often cited as a reason for suboptimal compliance, yet pet owners have reported that they would be willing to pay a premium cost for ease of medication administration.[4] This information may help veterinary teams feel more comfortable stocking and prescribing medications in forms that are easier to administer. Caution must be taken, however, that ease of administration does not supersede the use of the appropriate medication to treat a given infection.

Adherence is a consistent challenge in the practice of medicine, regardless of species, but constitutes a unique challenge for feline patients. Given their behavioral tendencies, defense mechanisms and taste preferences, cats require different handling and medication administration techniques than dogs, and may benefit from different medication formulations. Supporting clients by making the medication administration as easy as possible is a crucial first step in promoting adherence to prescriptions.

Lessons learned from human medicine can be applied within veterinary clinics to help address the challenge of adherence as it pertains to antimicrobial usage. Identified barriers to adherence among human patients include lack of understanding of the importance of the medication, complexity of regimen and cost, and ineffective communication between the patient and physician.[4] Interventions to address these barriers generally fall under three categories: technical, behavioral and educational – all of which are transferable to veterinary patients.

An example of a technical intervention would be simplification of prescriptions. This could be accomplished by maximizing the ease of administration by accounting for the physical properties of the drugs (liquid, pills, capsules, etc.), minimizing the number of medications and/or reducing the frequency of administration.

An example of a behavioral intervention would be providing instructions for clients to pair medication administration with play, food or other positive interactions. Positive reinforcement is an easy concept to explain to owners and can make the time around medication administration an opportunity to enhance the human-animal bond, rather than detract from it.

An example of an educational intervention would be providing clients with printed, pictorial or other instructions on effective medication administration. Reinforcing these instructions with communication techniques such as in-hospital demonstration, text messaging and/or follow-up calls can help clients avoid missed doses and otherwise support at-home adherence to the prescription.[4]

These approaches can be used to develop processes that address specific client, patient and environmental barriers to medication adherence. By implementing these processes and performing ongoing evaluation of their effectiveness, hospital teams can achieve greater adherence among their patient population and client base.

› Quality Improvement

The 2017 VET Report introduced the tenets of healthcare quality improvement through the framework of the Model for Improvement. This model, a key tool of quality improvement science, instructs a user to ask three questions when solving a problem:

1. What is the **AIM**, or goal, that is to be accomplished?
2. What **MEASURE** will be used to determine whether the goal has been attained?
3. What **CHANGE** will be implemented to incite improvement?

When choosing a specific change for implementation, it is important to understand that not all changes to a system have equal likelihood of driving improvement.[6] Systemic changes, such as system design/redesign, lead to the most reliable and long-lasting transformation by supporting the right behaviors while discouraging the wrong behaviors. Environmental changes, such as standardization, checklists and reminders, tend to be moderately effective with relatively stable results. Educational changes, such as training and knowledge transfer, are generally the least reliable approach due to the human tendency to make mistakes, forget or misinterpret new information and policies. As such, having systems in place to mitigate these issues will ultimately lead to the most favorable outcomes.

The American Animal Hospital Association's (AAHA's) 2009 study of compliance listed seven effective habits of veterinary practices with successful compliance programs.[4] Practices achieved greater compliance when they employed four or more of the following habits:

- Evaluating compliance on a frequent basis
- Monitoring several areas of compliance
- Attending compliance training workshops
- Using multiple approaches to client education and communication
- Conducting staff training exercises
- Investing in compliance improvement
- Developing and using written practice protocols

Drawing from the Model for Improvement and AAHA's habits of greater compliance, a veterinary hospital can craft a plan to improve compliance with antimicrobial guidelines and adherence to prescriptions in their feline patients:

The first step is to create an AIM, a goal that clearly states what will be accomplished. That goal, once described and written down, could become the foundation for a written practice protocol that supports the AIM. For example, a practice that aims to improve use of C&S testing with recurrent UTIs and client/patient adherence with the indicated antimicrobial, might have an aim of *"Improve numbers of urine samples submitted for C&S in recurrent urinary tract infections by 75% within 6 months. Improve owner adherence with the indicated antimicrobial drug by 50% within 6 months."*

Notice that the AIM statement includes a comparative measure based on performance prior to the beginning of the quality improvement journey. Once an aim has been established, the hospital must understand how to MEASURE the desired goal. Depending on the sophistication of the hospital's medical records or practice management software, the measure might be tracked through electronic means or via less sophisticated approaches such as a clipboard in the laboratory area where cases are tracked. The important component is that the measure is objective and accurately reflects the desired change. Once a baseline measure is obtained, compliance can be tracked and measured, and the journey toward quality improvement can begin.

The final step of the Model for Improvement is to determine the actual CHANGE. Having laid out the aim, the practice might write a practice protocol that supports this aim. For example, the protocol may indicate that C&S testing should be offered for every case of recurrent UTI that enters the hospital, and that clients should receive a demonstration and written instructions for administration of prescribed medication. The clinic might ensure that a checklist reminds all members of the team what steps should be taken with UTI cases, and have reminders in the pharmacy near the drugs that are frequently prescribed for UTIs. Client education materials with printed instructions could be prepared and a system for text messages and/or reminder calls put in place to check in with clients after they have left the hospital. All of these changes would promote improved compliance and adherence in patients with lower urinary tract signs, leading to more responsible and judicious use of antimicrobials.

CONCLUSION

This report has presented feline antimicrobial usage data for RTIs and UTIs treated at Banfield Pet Hospital and examined challenges with compliance and prescription adherence among feline patients. The overarching goal is to improve concordance of companion animal antimicrobial use with ISCAID treatment guidelines by identifying and addressing key barriers to judicious antimicrobial use, highlighting ways in which veterinary teams can change their behaviors to improve compliance and providing strategies that will enable clients to administer antimicrobials more effectively and appropriately.

We hope that by bringing some of the key opportunities for improvement to light – particularly the use of appropriate and thorough diagnostic testing and opportunities for improved pharmaceutical options – we can help drive a conversation among companion animal veterinarians and the industry to identify ways to proactively address antimicrobial resistance at an individual and systemic level. While the solution is not easy and there is no guarantee of success, there are certainly steps that can be taken to minimize our impact and attempt to counteract current trends in the spread of antimicrobial resistance. By understanding current widespread practices and opportunities, and overlaying an understanding of process-driven ways by which we can improve, our profession can embrace a responsible path forward that allows us to treat our patients appropriately while also protecting public health.

FOOTNOTES

a. Qualtrics, Qualtric Research Suite, Provo, UT and Seattle.

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