



A study into antimicrobial use across PDSA and beyond.

PDSA Antimicrobial Stewardship Report

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About PDSA

Since 1917, PDSA has worked tirelessly to improve the welfare of pets across the UK by providing free and reduced-cost veterinary care to the pets of those experiencing financial hardship, and advocating for the wellbeing of companion animals. Every day in our 48 Pet Hospitals across the UK, PDSA vets and vet nurses provide veterinary care to sick and injured pets whose owners otherwise couldn't afford to pay the full cost of treatment.

This Report

The issue of antibiotic usage and resistance in companion animals is of significant concern both globally and within the UK. Antibiotics are essential in both veterinary and human medicine but their use, whether appropriate or not, creates a powerful selection pressure on bacteria and is the primary cause of antibacterial resistance¹, posing a serious threat to both animal and human health. Eliminating unnecessary use in people and animals is essential to safeguard antibiotics for the future.

PDSA is committed to antimicrobial stewardship and has produced protocols focused on this area in recent years, achieving demonstrable reductions in antimicrobial use across its network of Pet Hospitals, without a negative effect on patient outcomes.

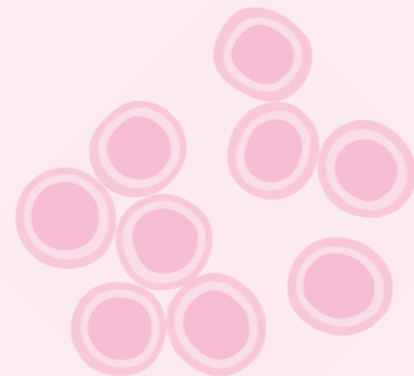
This report provides an overview of the work PDSA has done to reduce antibiotic use, alongside exploring the initiatives and collaborative efforts taken by organisations such as the **Responsible Use of Medicines Alliance, Companion Animals & Equine (RUMA CA&E)** to improve antimicrobial stewardship and ensure the continued responsible use of antibiotics in veterinary medicine².

RUMA CA&E

In 2020, PDSA was one of the founding members of RUMA CA&E, formed to look at the use of medicines in companion animals and equids. Inspired by the success of UK farm animal sectors in reducing antibiotic use, RUMA CA&E covers the responsible use of medicines in dogs, cats, rabbits, small mammals, exotic animals kept as pets, and equids. The aim is for the UK to lead the way in these sectors through evidence-based and measurable activities that will promote and enhance stewardship.

The voluntary alliance of stakeholder organisations from across the companion animal and equine sectors provides leadership and encourages innovative and proactive efforts to improve the responsible use of medicines whilst optimising and protecting animal health and welfare, as well as human and environmental health and welfare.

The collaboration includes veterinary and animal welfare organisations, industry representatives, universities and governmental bodies. Their collective aim is to address issues related to the use of medicines, including antibiotics, in companion animals and to ensure these medicines are used judiciously and responsibly.



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Methodology

To understand antibiotic usage for dogs, cats, and rabbits, the DDDVet calculation is derived from a calculation to quantify antibiotic usage in companion animals using the principles developed by the European Medicines Agency (EMA)³.

The DDDVet/animal metric is used to measure the number of Daily Defined Doses (DDDVet) per animal per year. DDDVet is determined by assumed average doses per kg animal per species per day, using standard doses from antibiotic product specifications. For long-acting products, DDDVet accounts for the daily dose rate and the length of activity.

The calculation process involves determining the DDDVet/animal for each active ingredient/route of administration for dogs and cats. The results are then combined to obtain a total figure. Similar to the mg/kg calculation, the mg of antibiotic ingredients and the total weight of the at-risk animal population are considered. The DDDVet/animal is calculated (for each active ingredient/ route of administration and for both dogs and cats) using the method below:

$$\frac{\text{Total amount of active ingredient (mg)}}{(\text{DDDVet (mg/kg/day)} \times \text{total animal population weight at risk (kg)})}$$

The results are then added together to get the total figure. The mg of antibiotic active ingredient and total weight of animal population at risk is calculated in the same way as described above for the mg/kg calculation.

The PDSA approach used two calculations in which the total population data included all canine and feline patients receiving care for the time period in question (2014, 2018, 2022) for either treatment or preventive. The treated animal population were those receiving preventive care only.

$$\text{a. } \frac{\text{Total mg in category}}{(\text{total population weight} \times \text{DDD value for category})} = \text{DDDVet}$$

$$\text{b. } \frac{\text{Total mg in category}}{(\text{total treated population weight} \times \text{DDD value for category})} = \text{DDDVet (Treated patients)}$$

These calculations involved obtaining an average weight of dogs, cats, and rabbits over a one-year period by involves excluding animals under 2 years old and those outside the average weight range. For dogs, exclusions include those older than 22.5 years, and for cats, those older than 27.5 years. The average weight is then calculated for the remaining patients.

Data on quantity of use for the following product categories was extracted from Merlin and applied to the calculations mentioned above:

- Amoxicillin Injection
- Amoxicillin Oral
- Cephalexin Oral
- Other Antibiotic Injection
- Other Antibiotic oral
- Sulphonamide Oral
- Tetracycline Oral

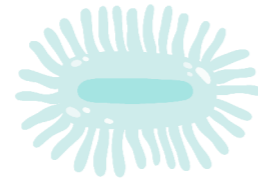


¹ Lushniak, B. D. Antibiotic Resistance: A Public Health Crisis. Public Health Reports **129**, (2014).

² Jones, G., Howard, S. & Bawn, M. Cross-sectoral alliance formed to promote the responsible use of veterinary medicines. Companion Anim **27**, (2022).

³ European Medicines Agency (EMA) 2020. Principles on assignment of defined daily dose for animals (DDDVet) and defined course dose for animals (DCDVet)

Introduction



Since the discovery of penicillin in 1928, anti-microbial medications have become an essential part of human and veterinary medicine, allowing the successful treatment of diseases that were historically incurable and saving millions of lives.

The emergence and spread of anti-microbial resistance (AMR) is a serious risk to human and animal health and has been declared by the World Health Organisation (WHO) as one of the top 10 global public health threats facing humanity⁴.

AMR occurs naturally over time through changes in microbial genomes⁵; allowing bacteria to evolve and adapt in response to exposure to antimicrobial agents, rendering them less or even ineffective. However, the development of resistant pathogens is accelerated by the misuse and overuse of antimicrobials, alongside a lack of clean water and sanitation, and inadequate infection control.

No new classes of antibiotics have been discovered since the 1980s⁶, so the protection of existing important medicines for future human and animal use is vital.

When microorganisms develop resistance, simple infections can become chronic, serious, and even life-threatening.

Tackling AMR requires a combined One Health approach, with human, veterinary and environmental professionals working together, considering the appropriate use of antibiotics alongside infection, prevention, and disease control.

Historically, the focus of AMR work and research in the veterinary sector has been on agriculture, with documented success. The use of antibiotics in farm animals reduced by 55% between 2014 and 2021, and the UK is one of the lowest users of antibiotics in Europe⁷. Total antibiotic use remains comparatively low within the companion animal sector; however, continued monitoring and appropriate use are essential. Our pets frequently live in close contact with humans within family homes, potentially providing opportunities for bacteria containing resistant genes to pass between us.

To ensure the continued availability and effectiveness of these medicines, they must be used responsibly, which requires anyone involved in antibiotic use to work collaboratively. An organisational system-wide approach to promoting and monitoring judicious use of antimicrobials to preserve their future effectiveness, commonly known as antimicrobial stewardship (AMS)⁸, is essential, covering the actions veterinary professionals take individually and collectively to preserve the effectiveness and availability of antimicrobial drugs. A successful AMS program considers conscientious oversight and responsible medical decision-making while safeguarding animal, public, and environmental health.

In the UK, all veterinary antibacterials are prescription-only medicines (POM-V), and vets have an obligation to use antimicrobials responsibly under the Royal College of Veterinary Surgeons (RCVS) Code of Professional Conduct⁹. Antimicrobial stewardship supports veterinary professionals to meet this obligation.

Good antimicrobial stewardship can be based around the three principles of **Reduce, Refine, and Replace**:

- 1 Reduce**
the need for antimicrobial use with infection and hygiene control
- 2 Refine**
the use of antimicrobials through monitoring and reporting
- 3 Replace**
antimicrobial use by employing alternate treatment regimes

Protect Me

Using these principles, guidelines and recommendations can be created. The British Small Animal Veterinary Association (BSAVA) together with the Small Animal Medicine Society (SAMSoc) have developed the 'Protect Me' campaign¹⁰:

- P**rescribe only when necessary
- R**educe prophylaxis
- O**ffer other options
- T**reat effectively
- E**mploy narrow spectrum
- C**ulture appropriately
- T**ailor your practice policy
- M**onitor
- E**ducate others



Recommendations include:

- ✓ the use of appropriate first line antibacterials
- ✓ appropriate use of topical antibacterials
- ✓ the use of alternatives such as disinfectants or antiseptics
- ✓ the implementation of hygiene and biosecurity practices to minimise the need for antibacterials

Wherever possible, culture and sensitivity should be performed, especially before prescribing antibacterials such as 3rd or 4th generation cephalosporins or fluoroquinolones.

PDSA has implemented and monitored a robust antimicrobial stewardship approach, through the use of both nationwide and local protocols, clinical audits and client education. This approach has enabled a significant reduction in antibiotic use, alongside a reduction in the use of critically important antibiotics such as fluoroquinolones.



⁴ <https://www.who.int/health-topics/antimicrobial-resistance>

⁵ Levy, S. B. & Bonnie, M. Antibacterial resistance worldwide: Causes, challenges and responses. Nature Medicine vol. 10 Preprint at <https://doi.org/10.1038/nm1145> (2004).

⁶ Ventola, C. L. The Antibiotics Resistance Crisis Part: Part 1: Causes and Threats. Pharmacy and therapeutics. **40**, (2015).

⁷ Sutherland, N., Coe, S. & Balogun, B. The use of antibiotics on healthy farm animals and antimicrobial resistance. (2023).

⁸ National Institute for Health and Care Excellence. Antimicrobial stewardship overview - NICE Pathways. Nice (2015).

⁹ Royal College of Veterinary Surgeons. Veterinary Medicines: RCVS Code of Professional Conduct. (2023).

¹⁰ BSAVA. Responsible use of antibacterials. (2022).

PDSA Animal Wellbeing (PAW) Report Data



Published annually since 2011, the **PDSA Animal Wellbeing (PAW) Report** provides UK companion animal welfare surveillance to identify trends and priorities, and to promote and monitor change. Each year, PDSA works with leading market research company, YouGov, to survey nationally representative samples of pet dog, cat and rabbit owners, providing insight into animal welfare issues, estimating pet population numbers, and understanding how people care for their pets. In addition, we regularly survey veterinary professionals to gather their thoughts and opinions about key welfare issues. The methodology for the Report can be found [here](#). The **2023 PAW Report** included questions to both owners and veterinary professionals who treat companion animals about their attitudes to antimicrobial use.

In human medicine, patient/carer expectations have been identified as one of the main drivers for inappropriate antibiotic prescribing by primary care physicians.¹¹ Several studies have looked at which patients are more likely to expect an antibiotic prescription from their doctor, under which circumstances and the reasons underlying this^{12,13}. Findings have been used to inform public health campaigns¹⁴, raising awareness of issues such as the ineffectiveness of antibiotics to treat common viral infections, and the importance of individual's use of antibiotics in minimising the development of antimicrobial resistance.

In the 2023 PAW Report survey of veterinary professionals, when asked about barriers to the implementation of antimicrobial stewardship in practice, veterinary professionals identified client expectations/attitudes to antibiotics (39% of respondents), pressure from clients to prescribe antibiotics (34%) and client compliance (33%) as being the most significant. A lack of awareness of the dangers posed by antimicrobial resistance amongst clients was also identified as a barrier by 24% of veterinary professionals.

We asked pet owners about their expectations when visiting the vet when their pet is poorly. 60% said they don't expect antibiotics but are happy to be led by their vet. Dog (61%) and cat (59%) owners were more likely to choose this option compared to rabbit owners (53%). 13% of all owners said they expect antibiotics but would trust their vet's decision if they didn't prescribe them.

These are particularly interesting findings given the feelings of veterinary professionals detailed above around expectations and pressure from clients to prescribe antibiotics. It may be that clients are more understanding of the circumstances when antibiotics may not be a suitable treatment choice, and further open discussions about what practices are doing to combat AMR will be welcomed.

2% (559,000) of owners say they expect antibiotics and would question their vet if they didn't prescribe them – 5% of rabbit owners (52,000) were more likely to choose this option compared to 2% of dog (264,000) and 2% of cat (241,000) owners. 1% (243,000) of all owners said they expect antibiotics and would ask their vet to prescribe them if they didn't.

Additional barriers identified by veterinary professionals to the implementation of antimicrobial stewardship in their practices include:

24% product availability impacting prescribing decisions

21% teams not following practice guidelines/protocols

20% a lack of data/benchmarks to know how they are doing

19% practice has not developed guidance/protocols on antimicrobial stewardship

This appears to reflect a worrying proportion of veterinary professionals who do not believe they have an effective antimicrobial stewardship programme in place at their practice. Successful antibiotic stewardship requires the implementation of a variety of preventive and management strategies. Engaging with all members in the practice when developing an AMS program helps to ensure that evidence-based decisions on the use of anti-microbials are applied consistently. Various initiatives are available to support clinicians in refining their antimicrobial choices, including the Protect Me initiative¹⁴ from BSAVA and SAMSoC, who have worked together to provide assets to support practices in discussing and drawing up practice guidelines on responsible antibacterial use. 14% of veterinary professionals said there were no barriers to the implementation of antimicrobial stewardship in their practice, and they were really good at it.

It is important that a consistent message is delivered, helping to educate clients about when antibiotics are not appropriate, along with the importance of using any prescribed medications responsibly. It is also essential that any antimicrobial stewardship strategy¹⁵ considers how to evaluate and monitor the effectiveness of the programme, including looking at antibiotic use, prevalence of resistant infections and clinical outcomes.

In human medicine, patient/carer expectations have been identified as one of the main drivers for inappropriate antibiotic prescribing by primary care physicians



60% Don't expect antibiotics

14% Don't know

13% Expect antibiotics, but trust their vet's decision if their vet didn't prescribe them

11% None of these options

1% Expect antibiotics and would ask their vet to prescribe them if they didn't

2% Expect antibiotics and would question their vet if they didn't prescribe them

Barriers to implementation of antimicrobial stewardship in practices

39% Client expectations/attitudes to antibiotics

34% Pressure from clients to prescribe antibiotics

33% Client compliance

24% Awareness of AMR amongst clients

24% Product availability impacting prescribing decisions

21% Team not following practice guidance/protocols on antimicrobial stewardship

14% of veterinary professionals said there were no barriers to the implementation of antimicrobial stewardship in their practice, and they were really good at it.

¹¹ Lum, E. P., Page, K., Whitty, J. A., Doust, J., & Graves, N. (2018). Antibiotic prescribing in primary healthcare: dominant factors and trade-offs in decision-making. *Infection, Disease & Health*, 23(2), 74-86.

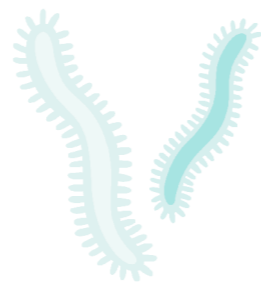
¹² Gaarslev, C., Yee, M., Chan, G., Fletcher-Lartey, S. & Khan, R. A mixed methods study to understand patient expectations for antibiotics for an upper respiratory tract infection. *Antimicrob Resist Infect Control* 5, (2016).

¹³ Fletcher-Lartey, S., Yee, M., Gaarslev, C. & Khan, R. Why do general practitioners prescribe antibiotics for upper respiratory tract infections to meet patient expectations: A mixed methods study. *BMJ Open* vol. 6 Preprint at <https://doi.org/10.1136/bmjopen-2016-012244> (2016).

¹⁴ S., F. et al. Public perceptions of antimicrobial resistance following the Keep Antibiotics Working national antimicrobial campaign. *International Journal of Pharmacy Practice* 27, (2019).

¹⁵ BSAVA. Responsible use of antibacterials. (2022).

Antimicrobial Stewardship at PDSA



PDSA has been on an antibiotic stewardship journey since 2010 when, inspired by the initiatives launched by the British Veterinary Association (BVA), BSAVA and the Federation of European Companion Animal Veterinary Associations (FECAVA)¹⁶ at the time (and further refined since), our first national protocol focused on this important area was developed and launched.

PDSA has applied the principles of Reduce, Refine, Replace during the subsequent years to inform our robust antimicrobial stewardship approach:

Reduce

the need for antimicrobial use through:

- ✓ Good infection control practice
- ✓ Good hygiene measures
- ✓ Prevention of conditions that may require antimicrobial therapy
- ✓ Educating clients about good husbandry practices and the importance of compliance

Refine

the use of antimicrobials through:

- ✓ Monitoring usage levels and usage behaviours through reporting
- ✓ Evidence based national and local protocol production informing the use of antimicrobials
- ✓ Audit to inform areas for action
- ✓ Ensuring a responsible and effective approach to prophylaxis
- ✓ Informed use of Highest Priority Critically Important Antibiotics (HPCIA's)

Replace

antimicrobial use by:

- ✓ Employing alternate treatment regimens where appropriate and effective
- ✓ Managing client expectations

This approach is employed whilst ensuring that appropriate welfare outcomes for patients are delivered and allowing clinicians to make ethical and professional choices for their patients. Working from the principle that the best way to ensure that bacteria do not become resistant to antimicrobials is to not expose them in the first place. Guidelines and protocols are designed so that antimicrobial agents are only used where clinically necessary.

PDSA Protocols and impacts

Between 2010 and 2016 PDSA developed and rolled out a number of national protocols focused on responsible use of systemic antibiotic therapy, these included:

Use of antibiotics in routine sterile surgery –

This protocol states that patients undergoing routine sterile surgery will not receive prophylactic antibiotic therapy except in a limited number of circumstances:

- A break in asepsis
- Surgery of duration greater than 60 minutes
- The presence of pre-existing infection(s)
- Animals considered to be immuno-compromised

Use of Fluoroquinolones – Critically important antibiotic classes such as Fluoroquinolones are reserved for use if indicated by culture and sensitivity. However, when clinical signs suggest a severe infection and cytology indicates these antibiotics could be an appropriate choice, then the need for empirical treatment with fluoroquinolones whilst the results of culture and sensitivity are awaited is determined by the responsible clinician. If culture and sensitivity results subsequently reveal a non multi resistant infection, treatment is de-escalated to an alternative antibiotic.

Appropriate use of antibiotics at first presentation –

Defined a number of conditions and presenting signs, including kennel cough, uncomplicated cat flu, cystitis, uncomplicated diarrhoea, cat bite abscessation (to name just a few) where evidence suggests that antibiotic therapy is not required in the first instance where signs of systemic illness are absent.

Between 2010 and 2016 PDSA developed and rolled out a number of national protocols focused on responsible use of systemic antibiotic therapy

In order to assess the impact of our antibiotic stewardship activities PDSA has traditionally monitored the proportion of our patient base receiving antibiotics (taken from clinical usage data) – if a patient does not receive antibiotics, the bacteria they carry are not in danger of developing resistance as a result of our treatment. The graph below (Figure 1) illustrates the impact that these national protocols had upon our systemic use of antibiotics as they were rolled out, with a rapid reduction in the proportion of our patient base receiving antibiotics from 43% in 2014, down to 28% in 2016 – a 35% reduction over just those few years. The levels stabilised after that to between 26% and 30% but maintained a slower overall downward trend until 2019.

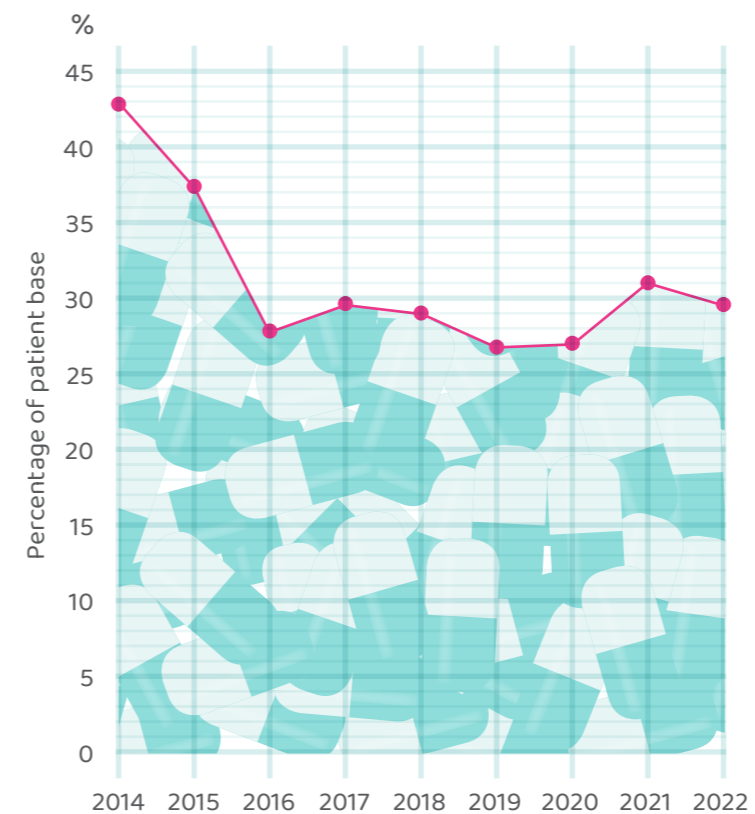
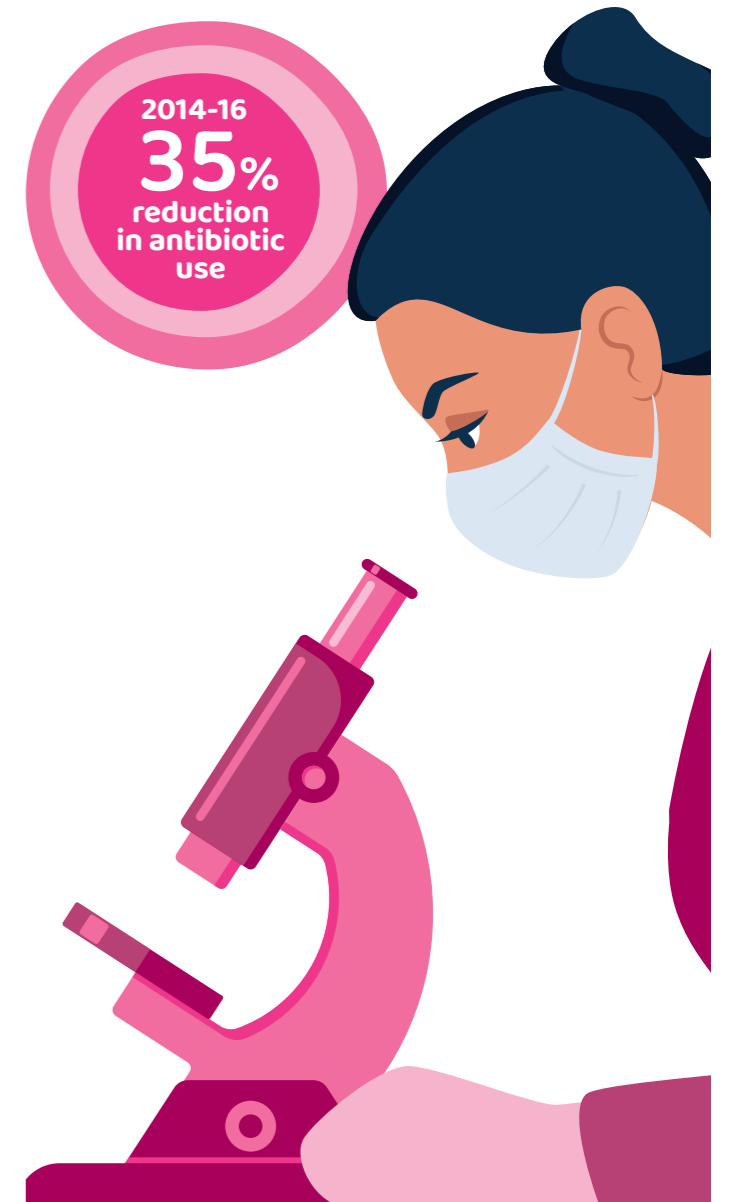


Figure 1. Percentage of PDSA patient base receiving antibiotic therapy



The limitations of this method of monitoring are illustrated during the pandemic years. During this period the focus of the service was to maintain access to veterinary care for those pets most in need of emergency and urgent interventions, which had the effect of reducing our overall pet numbers slightly, but maintained the numbers receiving that critical care. The impact of delivering a more focused service on this measure was to drive an increase in the proportion of our patient base receiving antibiotics, even though the actual numbers of pets receiving antibiotics remained largely static.

¹⁶ Vilen, A. Antimicrobial FECAVA Initiative. Making the responsible use of antimicrobials work in clinical practice. in THE FECAVA SYMPOSIUM The proper use of antimicrobials in companion animal practice (2013).

PDSA teams have achieved a fantastic 64% reduction in DDDVet HPCIA between 2012 and 2022

Whilst the % patients measure is useful to define 'how many' of our patients are receiving antibiotics, it had previously been difficult to consistently and easily measure 'how much' was being given to our patients from the usage data. The Daily Defined Doses (DDDvet) per animal per year (DDDvet/animal) measure, developed by the Veterinary Medicines Directorate (VMD) alongside and with the support of the RUMA Companion Animal and Equine group in 2022, has now made this possible. PDSA has taken this measure and applied it to antibiotic usage data for dogs, cats and rabbits, gathered from 2012-2022, for the first time to establish an organisational measure which can be utilised alongside the % patients measure to give a fuller picture of antibiotic usage.

Figure 2, below, shows the total DDDvet, calculated from usage data, for PDSA from 2012 to 2022 (pre-2020 calculated every other year):

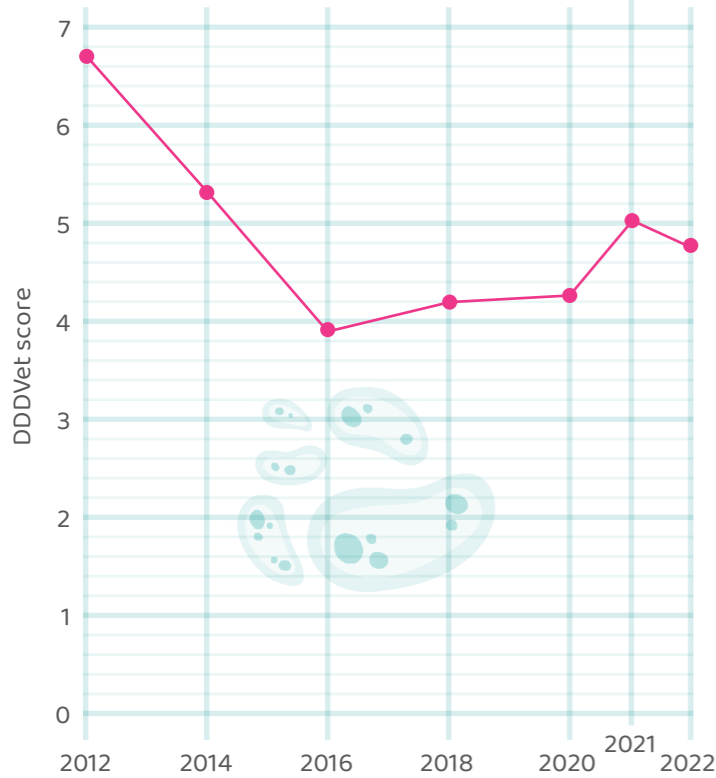


Figure 2. PDSA DDDVet

The usage showed year on year significant reductions from 2012 through to 2016 and then an ongoing reducing trend with smaller reductions from 2016 to 2018 and 2020. PDSA usage data shows the same pattern as that seen in the national DDDvet calculated from sales data in the Veterinary Antimicrobial Resistance and Sales Surveillance (VARSS) Report¹⁷, with an increase on previous levels in 2021 and then a drop back in 2022.

It is difficult to ascertain the reasons for this when sales data is utilised as those data do not come with any clinical context. However, this new method for utilisation of usage data opens the opportunity to further explore the reasons for those changes.

A note of interest that, as a result of the pandemic and the RCVS derogation to remotely prescribe, in 2020 PDSA consultations moved to 85% remote, and this did not appear to impact upon our % of patients usage measure or our DDDvet measure in that year. PDSA gradually reduced the levels of remote care and remote prescribing during 2021 and ceased prescribing remotely for patients not under our care in 2022 when the derogation was removed.

It appears that DDDvet applied to practice data will give higher results than when applied at population level as in the VARSS Report¹⁷. It is postulated that the reason for this is due to VARSS data being based on total sales data and **PAW Report** total population figures which will include:

- Pets not registered at a vets
- Pets registered at a vets but have not visited
- Pets registered at a vets but only visited for preventive care
- Pets registered at a vets that have visited for sickness/health reasons

The practice population data will only include a subset of the population at risk i.e. those pets in groups 3 and 4, as the practice has little visibility of those in groups 1 and 2 in the clinical data. Therefore any figure calculated will be higher than total antibiotic sales and total population based calculations.

DDDvet for Highest Priority Critically Important Antibiotics (HPCIA) has also been calculated and the results show that our teams have achieved a fantastic 64% reduction in DDDvet HPCIA between 2012 and 2022, see figure 3.

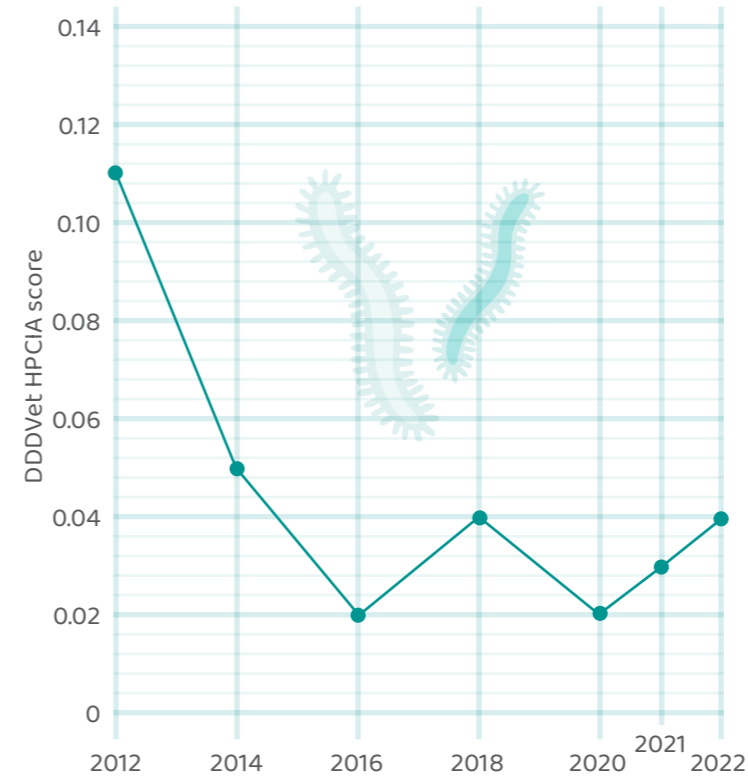
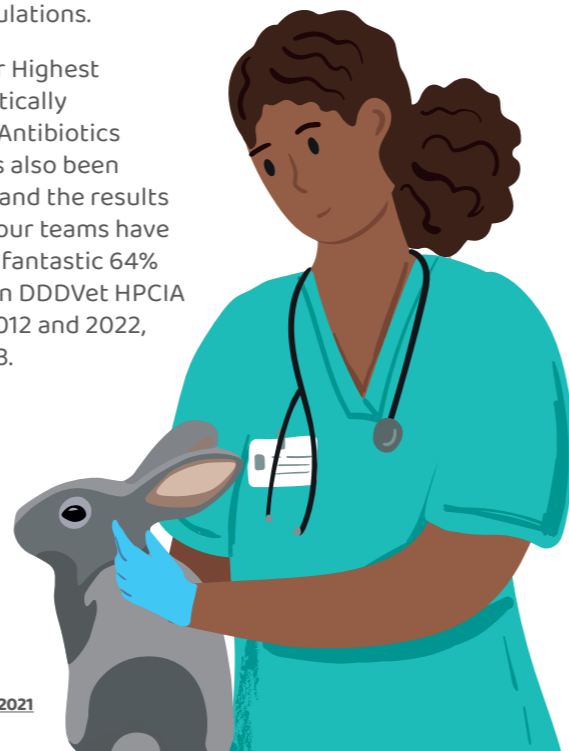


Figure 3. PDSA DDDVet HPCIA

There are two important variables when considering HPCIA usage; how much HPCIA is being used, but also the behaviour of clinicians in their use of HPCIA in relation to their overarching antibiotic prescribing decisions. Therefore, utilising these data it is possible to quote the proportion of our antibiotic usage that is HPCIA, as well as the absolute amounts.

These data would suggest that PDSA clinicians have been utilising HPCIA at a rate of between approximately 0.5 and 0.8% as a proportion of overall antibiotic use.

When this is expressed as a proportion of antibiotic overall usage (DDDvet HPCIA/DDDVet) this class of drug constituted 1.7% of usage in 2012, reducing to 0.8% in 2022, a 53% reduction, as in figure 4.

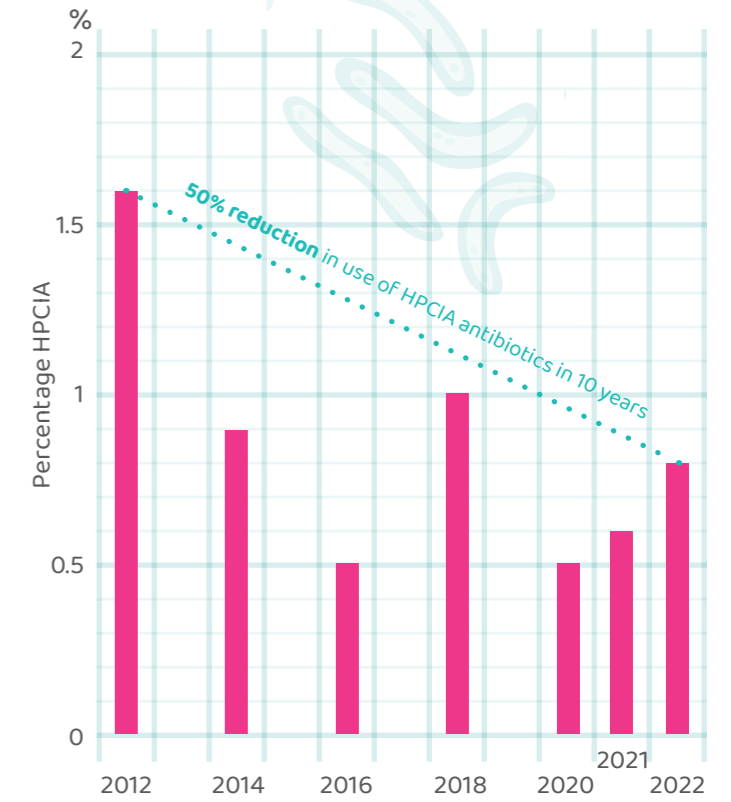


Figure 4. PDSA %HPCIA

It is important to recognise that these organisational results are heavily influenced by the levels of utilisation in dogs (given their higher weight and the larger population treated) so it is valuable to break them down to species level to gain further insight. The VARSS report 2023¹⁷ states:

"It should be noted that the antibiotic use trends for dogs and cats follow a similar trend. One explanation for this could be that, in many cases, the same products are used in dogs and cats, and the sales are then split into dogs and cats based on estimates provided by the pharmaceutical companies. This may not reflect true usage trends, for example if data was based on veterinary practice records."

However, the species usage data in figure 5 on the following page would suggest that the true usage trends are indeed similar for dogs and cats.

¹⁷ 18 2665795-v1-UK_VARSS_REPORT_2022_2023_PDF (publishing.service.gov.uk)
<https://www.gov.uk/government/publications/veterinary-antimicrobial-resistance-and-sales-surveillance-2021>

PDSA has been successful in significantly reducing the levels of HPCIA in all species over the years, with cats and rabbits showing the greatest reductions

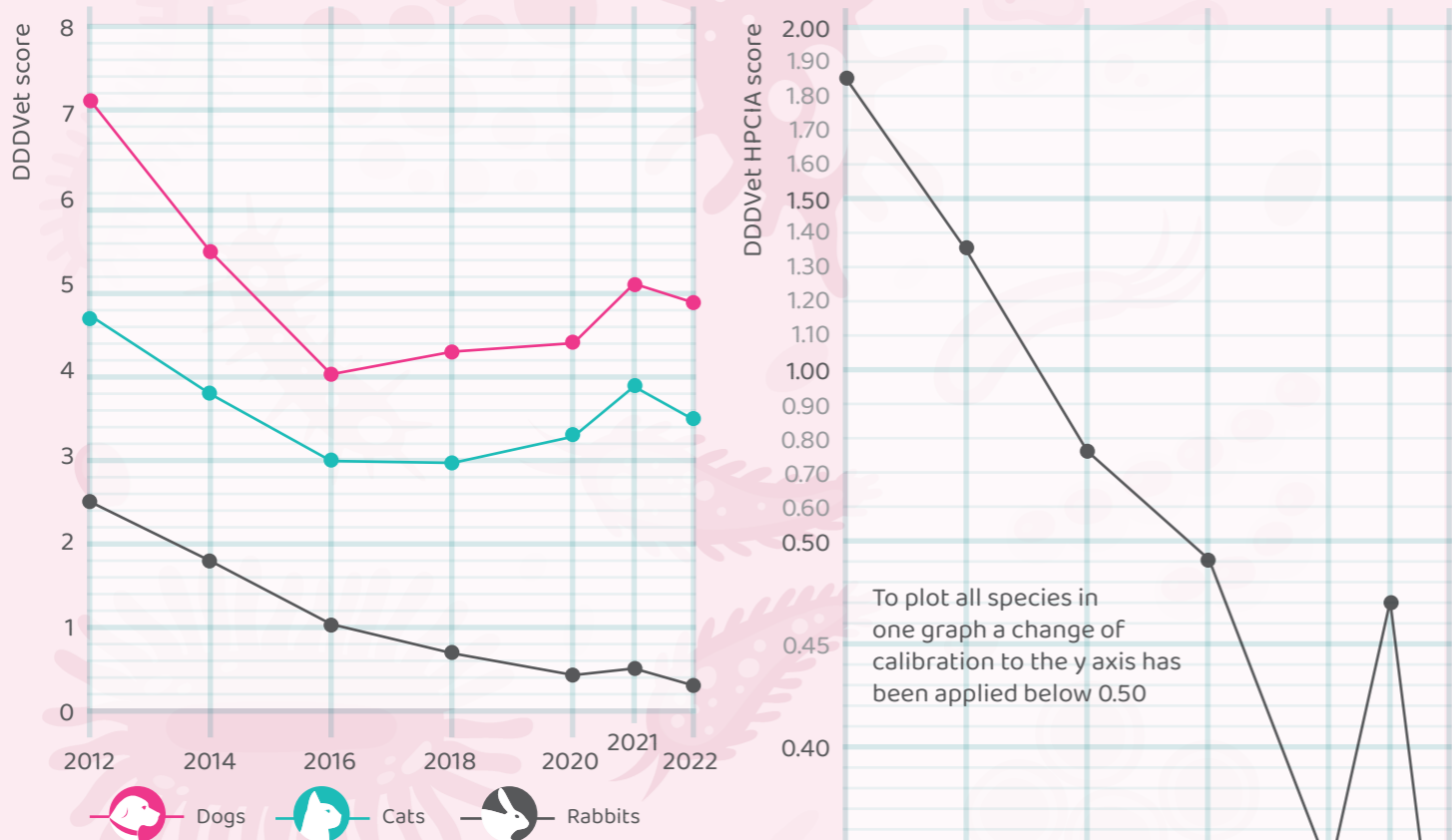


Figure 5. DDDVet for dogs, cats and rabbits

All three species analysed showed a rise in 2021 and then a drop back towards previous levels in 2022 (figure 5).

PDSA has been successful in reducing the levels of HPCIA over the years with usage in both cats and rabbits showing a significant and ongoing downward trend between 2012 and 2022. Following an initial reduction in dogs, usage in this species appears to have settled at between 0.25 and 0.5, however, unlike the other species analysed, the reduction in 2022 towards previous levels does not appear to have taken place. This has driven the ongoing increase in use of this product class seen at the organisational level, and the reasons for that will need further analysis.

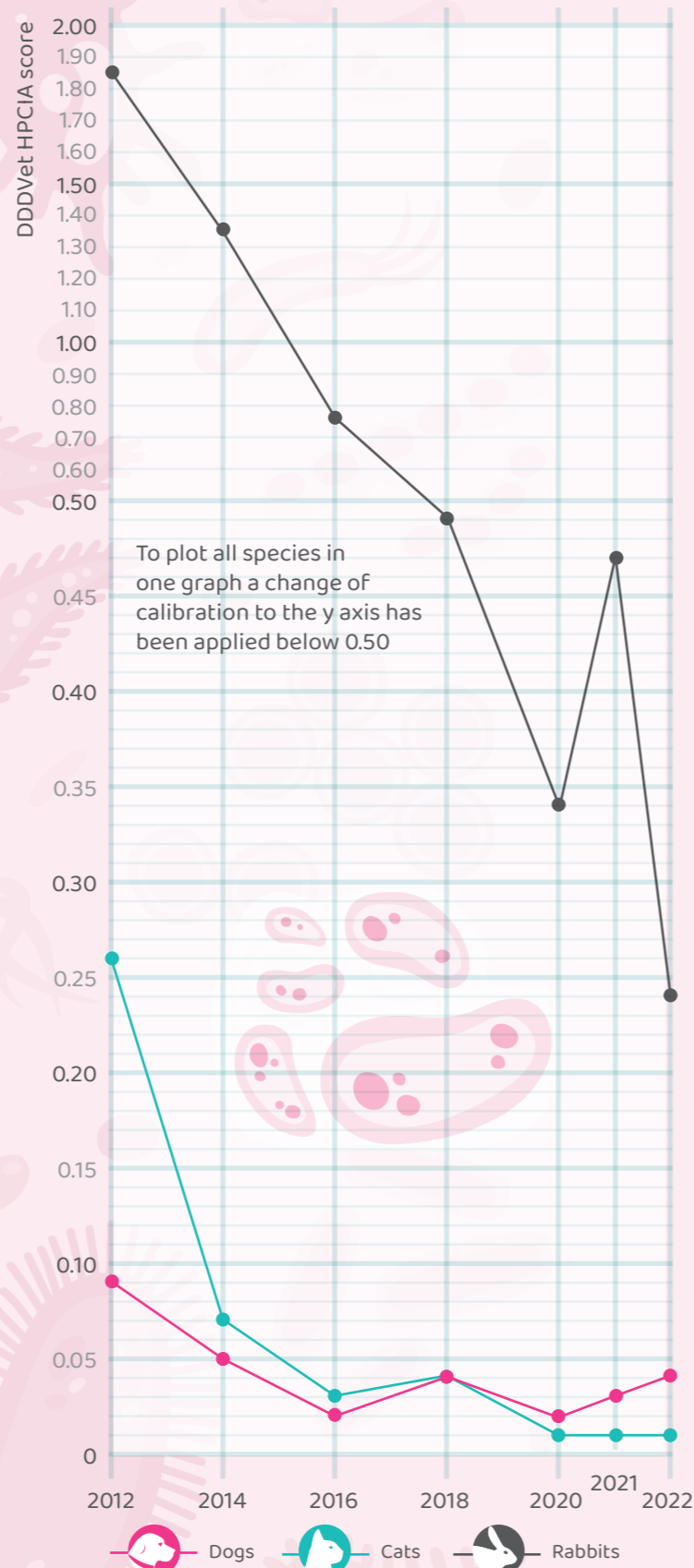


Figure 6. DDDVet HPCIA for dogs, cats and rabbits

The levels of usage within PDSA are significantly below those quoted in VARSS at the national level, with:

- **Dogs: in 2022 having a DDD HPCIA of 0.04, compared to the VARSS sales data result of 0.19**
- **Cats: in 2022 having a DDD HPCIA of 0.01 compared to the VARSS sales data result of 0.9.**

When expressed as a percentage of overall DDDVet by species (figure 7) it can be seen that our clinicians' behaviours in choosing HPCIA have changed most significantly in their utilisation of these classes of product in cats, with significant reductions over the years. Utilisation in dogs has reduced overall but appears to be varying between 0.5% and 1%. Utilisation of HPCIA in rabbits has remained high, generally appearing to be in the 70-80% range, probably as a result of the limited number of licensed products available to treat this species.

The next steps for this new method of reporting will be to:

- **Link the trends in utilisation seen in these data with clinical scenarios and clinical decision making:**
 - Recently increased use of HPCIA in dogs
 - Alternatives to the use of HPCIA in rabbits
 - Identification of other clinical areas where new national protocols may be appropriate.
- **Ongoing monitoring and focus of activities to ensure the levels of usage return to pre-pandemic levels**
- **Further explore how these DDDVet data may be introduced and applied at our Pet Hospital level.**

As well as measuring antibiotic usage at national level, PDSA currently provides reporting at regional, area and Pet Hospital level allowing all parts of the organisation at all levels to be able to compare their responsible management of antibiotics with their peers.



Figure 7. %HPCIA for dogs, cats and rabbits

The protocol was rolled out during late 2010 and the impact was almost immediate, with the proportion of preventive surgeries receiving antibiotics dropping from 35% down to 11%

In addition to assessing the impact of antibiotic stewardship initiatives at overall product level, PDSA tracks the impacts at initiative level wherever possible.

Two examples are shown below.

- Antibiotic usage in preventive surgery (Figure 8)
- Topical antibiotic use in otitis cases (Figure 9)

Antibiotic usage in preventive surgery

- Number of preventive surgeries with antibiotics
- Percentage of preventive surgeries with antibiotics
- COVID-19 era where lockdowns had an impact on the deliverability of surgical care

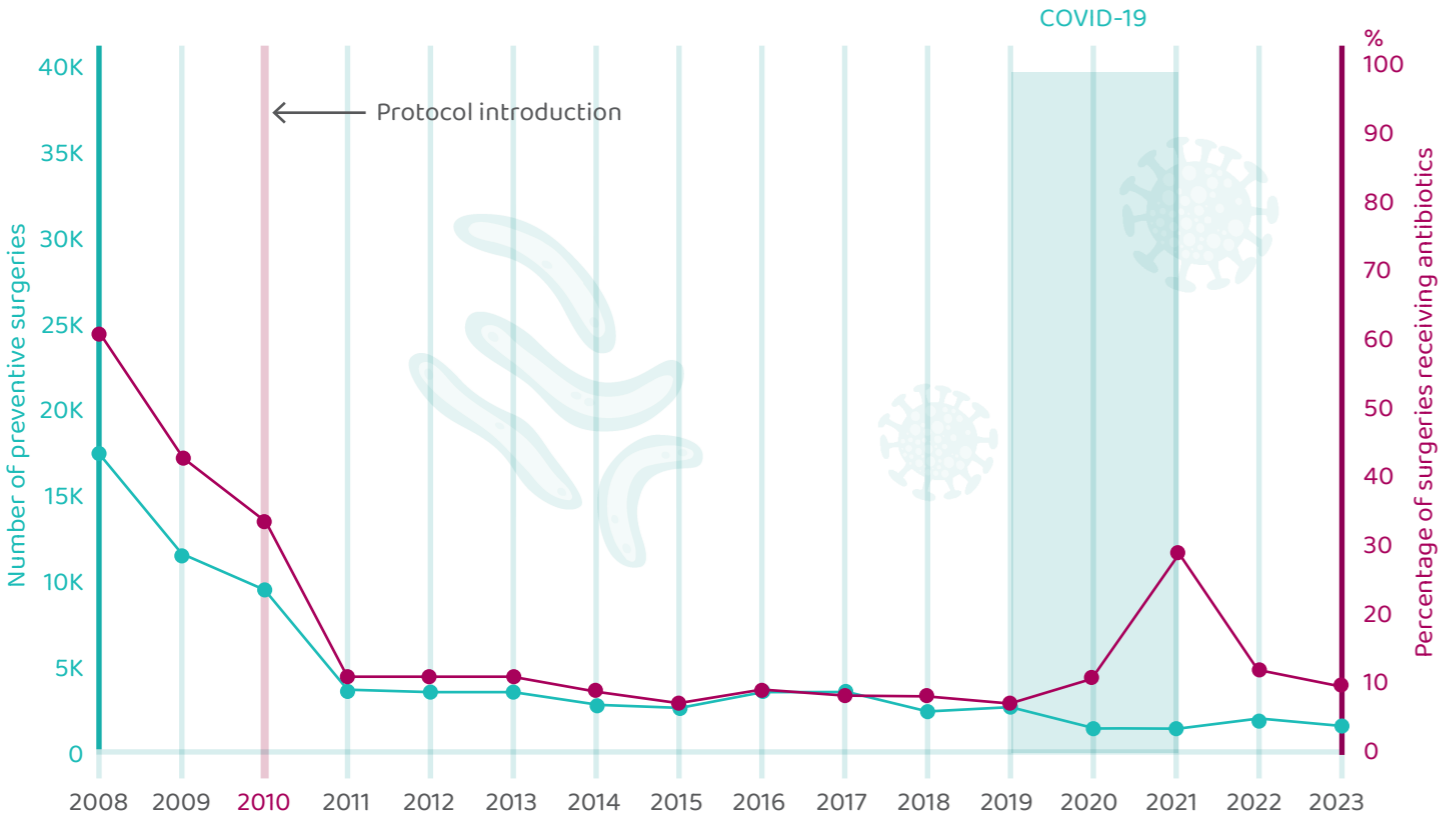


Figure 8. Total number of preventive surgeries and percentage of preventive surgeries with antibiotics



Impact of the 'Use of antibiotics in routine sterile surgery' protocol

PDSA monitored the impact of this protocol through reporting on the numbers of preventive surgeries (as indicator procedures) that received antibiotics on the same day as the surgery. Whilst the rate of antibiotic use in these surgeries had reduced over the previous two years, the rate of reduction had slowed. The protocol was rolled out during late 2010 and the impact was almost immediate, with the proportion of preventive surgeries receiving antibiotics dropping from 35% down to 11% over 2011 – a reduction of 67%. In the following years that proportion has remained largely stable at around 10% of preventive surgeries receiving antibiotics with very little ongoing messaging required.

It may be seen that the pandemic had an impact upon the proportion of our preventive surgeries having antibiotics. However, this can be explained by looking at the number of preventive surgeries taking place: PDSA, like the rest of the profession, was focused on emergency and urgent care during this period.

Topical use of antibiotics

In 2017, after a number of years focusing on systemic use of antibiotics, we turned our attention to topical use of antibiotics, in particular to the use of antibiotic containing ear drops in our otitis national protocol. This protocol was based upon the fact that the majority of otitis cases do not have a primarily infectious cause¹⁸, most infections are secondary and arise as a result of the environment within the ear can being disrupted by allergic and other primary causes.

A common approach to otitis for many years has been to reach for the antibiotic ear drops in the majority of cases presented. Our protocol stated that unless a purulent discharge is identified, cases should be managed to restore an environment which does not encourage or support infection.

The primary treatment considered for otitis cases should be anti-inflammatory therapy and routine ear cleaning every 48 hours, however, if a purulent discharge is identified but no rods are seen on cytology then first line antibiotic containing drops should be used. If rods are seen on cytology then second line antibiotic containing drops could be used i.e. those containing HPCIA antibiotics. This approach was designed to replace antibiotic therapy in appropriate cases and refine the choices of antibiotic used to ensure that the right drug is used for the right bacterium where antibiotics were necessary.

¹⁸ O'Neill, D. G., Volk, A. V., Soares, T., Church, D. B., Brodbelt, D. C., & Pegram, C. (2021). Frequency and predisposing factors for canine otitis externa in the UK—a primary veterinary care epidemiological view. *Canine medicine and genetics*, 8(1), 1-16.

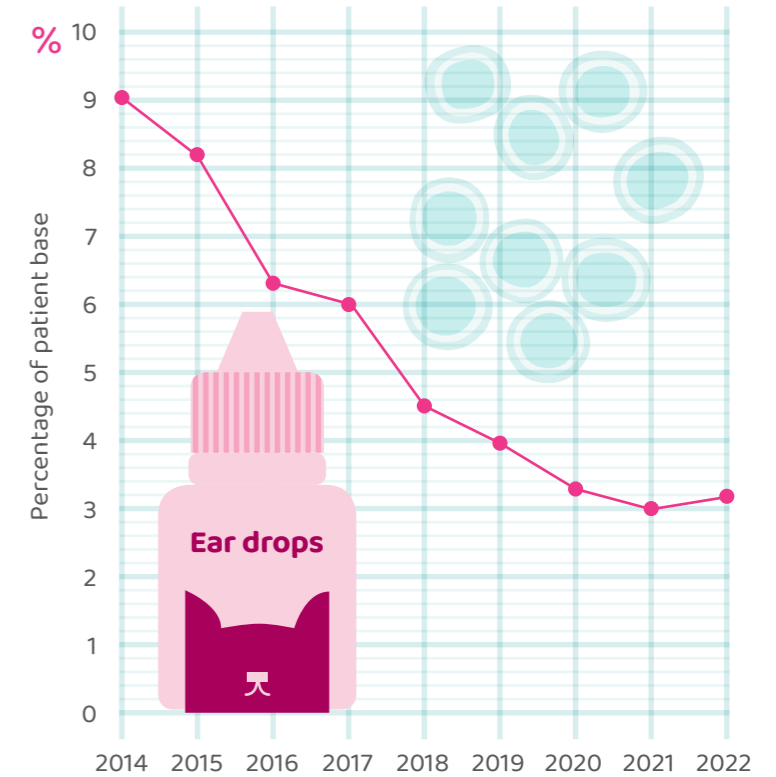
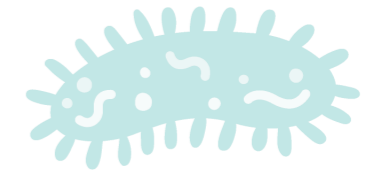


Figure 9. Percentage of PDSA patient base receiving antibiotic-containing ear drops



Monitoring of the success of the protocol has been based on the proportion of ear cleaner/antibiotic ear drops usage and levels of second line antibiotic ear drop usage, alongside the proportion of the overall patient base receiving antibiotic ear drops. It may be seen that use of antibiotic containing ear drops had been reducing naturally as the antibiotic stewardship messages had become embedded, however this reduction had slowed by 2016 and was at approx. 6%.

The introduction of the protocol resulted in a rapid reduction and between 2017 and 2018 and then an ongoing steady reduction since, settling out at approx. 3%, half the level it was when the protocol was cascaded.

It is important that pet owners are helped to understand the role they play in preventing the development of AMR

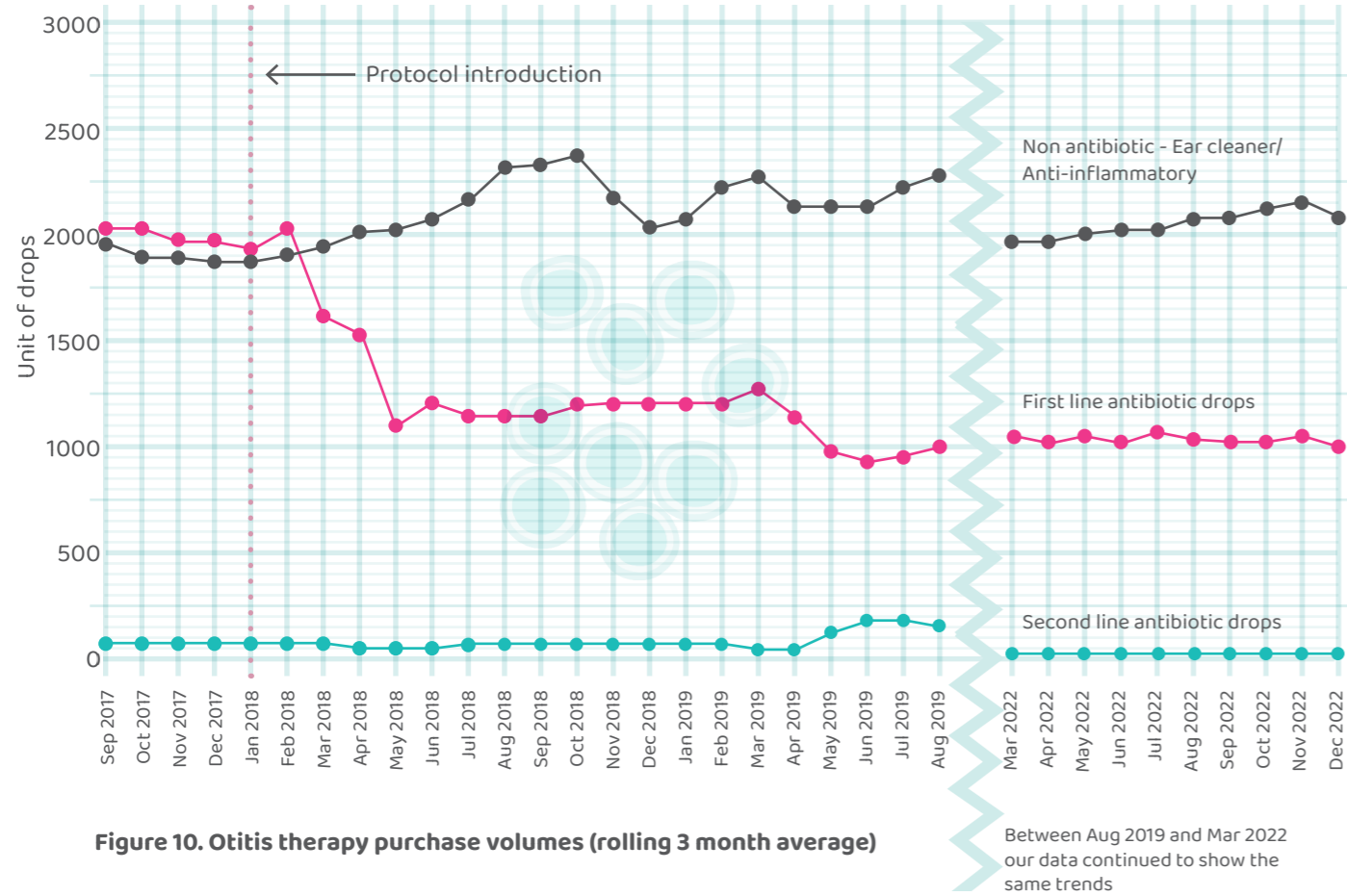


Figure 10. Otitis therapy purchase volumes (rolling 3 month average)

Between Aug 2019 and Mar 2022 our data continued to show the same trends

In addition to monitoring the impact of the protocol at patient level, the impact on product purchases was also monitored. The changes stimulated by the protocol are illustrated in figure 10.

- Prior to introduction of the protocol, the data suggests cases of otitis externa were treated with both ear cleaner and antibiotic ear drops in roughly equal proportions, but our clinicians were already selectively utilising the HPCIA containing products.
- Following introduction of the protocol, the same number of animals were being treated for ear conditions, but the purchase of antibiotic containing drops rapidly reduced by about 25-30%.
- The usage of second line antibiotic ear drops remained constant - apart from a period of stock issues with first line products in 2019 which forced our clinicians to utilise them at higher than normal rates.

• Data from 2022 onwards demonstrate that the impact of the protocol has been sustained and that cases of otitis externa continued to be managed using significantly less antibiotic ear drops than before protocol introduction.

- The long-term data also suggest that the protocol has been successful in management of otitis cases - if cases of otitis externa were not being controlled, more cases would become chronic, the numbers on treatment would gradually increase and use of ear therapy and antibiotics would have risen above previous levels due to treatment of the more chronic cases.



In addition to national protocols each Pet Hospital develops and implements local protocols and audits, using the BSAVA 'Protect' poster as guidance. The 'Protect' poster, first created in 2012, promotes the creation of a practice-specific policy for empirical antibacterial use and suggests suitable antibacterials for conditions caused by, or complicated by, bacterial infection. To support conversations with clients, BSAVA non-prescription pads (detailing conditions which antibiotics are not indicated for) are used.

Any antimicrobial stewardship programme requires support from clinical teams in practice. This can only be achieved by full and open discussions on the issues, and ensuring clinicians feel empowered to make their own decisions under guidance.

PDSA's Clinical Scope and Quality team (CSQ), consisting of vets and vet nurses working in its Pet Hospitals, monitor, review and develop PDSA clinical practices to ensure a sustainable, ethical and effective standard of veterinary service is provided to PDSA patients. This open and collaborative approach allows the development of treatment standards and promotes the use of treatment protocols in conjunction with Pet Hospital teams.

PDSA would like to extend a huge thank you to all of our clinicians and teams for their commitment to antibiotic stewardship and the enthusiasm with which they have embraced stewardship initiatives – you have all made a significant difference to antibiotic use at PDSA and played your part in protecting these critical treatment options for the future.

Owner Education

It is important that pet owners are helped to understand the role they play in preventing the development of AMR. As well as discussions in practice, owners can be supported with educational materials.



PDSA's Pet Health Hub, a free online resource for pet owners, written by veterinary professionals, covers a wide range of subjects, including specific pages on antibiotics and AMR, as well as videos on how to administer medications to pets, helping owners to be compliant with prescribed antibiotics.

Conclusion

Continued progress on antimicrobial stewardship by veterinary professionals is essential to preserve the effectiveness of these lifesaving medications for years to come. Intensification of collaborative work between regulatory bodies, clinicians, research and industry is needed, alongside public education and awareness campaigns.

Veterinary access to this invaluable treatment option in the future is not guaranteed, though restrictions on antibiotic use in animals could potentially lead to detrimental effects on animal health and welfare. While the UK Government has so far not considered legislation in this area publicly, in 2021 the European Union debated a motion to ban the use in animals of the Highest Priority Critically Important Antimicrobials (HPCIA) on the WHO list (e.g. polymyxins/colistin, macrolides, (Fluoro)quinolones and 3rd & 4th generation cephalosporins). The motion was rejected, as recommended and campaigned for by the Federation of Veterinarians in Europe (FVE), if it had passed it could have created a worrying precedent.

In veterinary medicine, the focus on antibiotic use has traditionally been in the farm animal sector, particularly where it was considered that the likelihood of development of antimicrobial resistance (AMR) may have been increased by management practices and be particularly relevant to human health. However, awareness of the importance of AMR in companion animals and the potential implications for humans is increasing, with research showing that owners can share common intestinal bacteria with their pets, and antimicrobial therapy in either pet or owner may increase the risk of shared bacterial resistance¹⁹.

While veterinary professionals recognise the serious implications of AMR, PAW Report data suggests that they consider it to be less of a priority when considered alongside other welfare issues affecting the UK's pets.

In the 2023 PAW Report, when asked to select which 5 issues would have the biggest health and welfare implications for pets in 10 years' time if not tackled, 20% of respondents chose AMR, with other issues such as exaggerated conformation in pedigree breeds (41%), behavioural problems (35%) and people purchasing pets from irresponsible sources (31%) more likely to be chosen.

By putting in place protocols to support antimicrobial stewardship, practices can help to raise awareness of the issue, both with colleagues and clients. Working together allows amplification of the message, ensuring a unified response to help owners and clinicians alike understand the importance of the responsible use of antimicrobials.

Various national and international initiatives are available to support clinical teams. As well as the BSAVA resources discussed earlier in this report, RCVS Knowledge has a dedicated AMR Hub²⁰, providing freely accessible, evidence-based knowledge and resources about responsible antimicrobial use. The Vet Team AMR Platform has CPD available to support clinicians' antibiotic stewardship, covering areas including communication, human behaviour change and infection control. In addition, the UK Health Security Agency's 'Antibiotic Guardian' initiative promotes the responsible use of antibiotics to clinicians and the public, encouraging people to sign a pledge demonstrating their commitment to reducing antibiotic use²¹.

In the UK, a collaboration of UK veterinary organisations, practices and charities come together to promote an **antibiotic amnesty** held for the past 2 years in November during Antibiotic Awareness Month, encouraging owners to bring unused antibiotics into practices for responsible disposal. As well as reducing the risk of discarded antibiotics contaminating the environment, this helps to spread the message about inappropriate use of leftover antibiotics and the importance of completing a prescribed course. It is an opportunity for all members of the veterinary team to raise awareness about antibiotic stewardship and contribute to the fight against AMR. The Federation of European Companion Animal Veterinary Associations (FECAVA) also has resources for pet owners on the responsible use of antimicrobials²².

Both human and veterinary medicine have made great advances in tackling AMR. The recognition in humans that antibiotics are not routinely indicated for simple upper respiratory infections, as vets have done with lower urinary tract disease in cats, are just two examples of how evidence-based changes in prescribing practices can make a real difference. It is essential that we continue to monitor antibiotic usage, and challenge traditional thinking, which may not always support modern responsible antibiotic stewardship.

This report has highlighted several areas in which PDSA's approach to antibiotic stewardship has successfully replaced, reduced and refined antibiotic use across our Pet Hospital network. While celebrating this achievement, and the hard work of the clinical teams who have made it possible, we know there is still more to be done and we will continue to record and monitor our antibiotic usage and clinical outcomes to help us identify areas for improvement in the future.

¹⁹ Wipler, J., Čermáková, Z., Hanzálek, T., Horáková, H. & Žemličková, H. Sharing bacterial microbiota between owners and their pets (dogs, cats). *Klin Mikrobiol Infekc Lek* **23**, (2017).
²⁰ <https://knowledge.rcvs.org.uk/amr/>
²¹ Kesten, J. M., Bhattacharya, A., Ashiru-Oredope, D., Gobin, M. & Audrey, S. The Antibiotic Guardian campaign: A qualitative evaluation of an online pledge-based system focused on making better use of antibiotics. *BMC Public Health* **18**, (2017).
²² Vřilén, A. Antimicrobial FECAVA Initiative. Making the responsible use of antimicrobials work in clinical practice. in THE FECAVA SYMPOSIUM The proper use of antimicrobials in companion animal practice (2013).

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**Thank you to everyone who is
already working alongside us
to improve pet wellbeing.
We can't do it alone.**

Thanks to players of People's Postcode Lottery
we're raising awareness about the importance of
the responsible use of antibiotics

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