

RCVS KNOWLEDGE
NATIONAL AUDIT FOR
SMALL ANIMAL NEUTERING
REPORT 2025

20 YEARS OF NASAN



RCVS Knowledge is a charity with a mission to advance the quality of veterinary care for the benefit of animals, the public and society. We empower and support veterinary teams to provide evidence-based, quality care and improved animal health and welfare outcomes.

Veterinary teams face many challenges in accessing up-to-date knowledge and applying it in practice. To support them and deliver our mission we:

- create and share practical support, tools and resources to help veterinary teams and other animal health professionals deliver better animal health and welfare outcomes in a structured and sustained way
- influence and inspire broader change that advances evidence-based veterinary practice in a way that benefits animals, people and the planet
- curate and raise awareness of veterinary history to ensure that veterinary care today and in the future is built on knowledge and understanding of the past.

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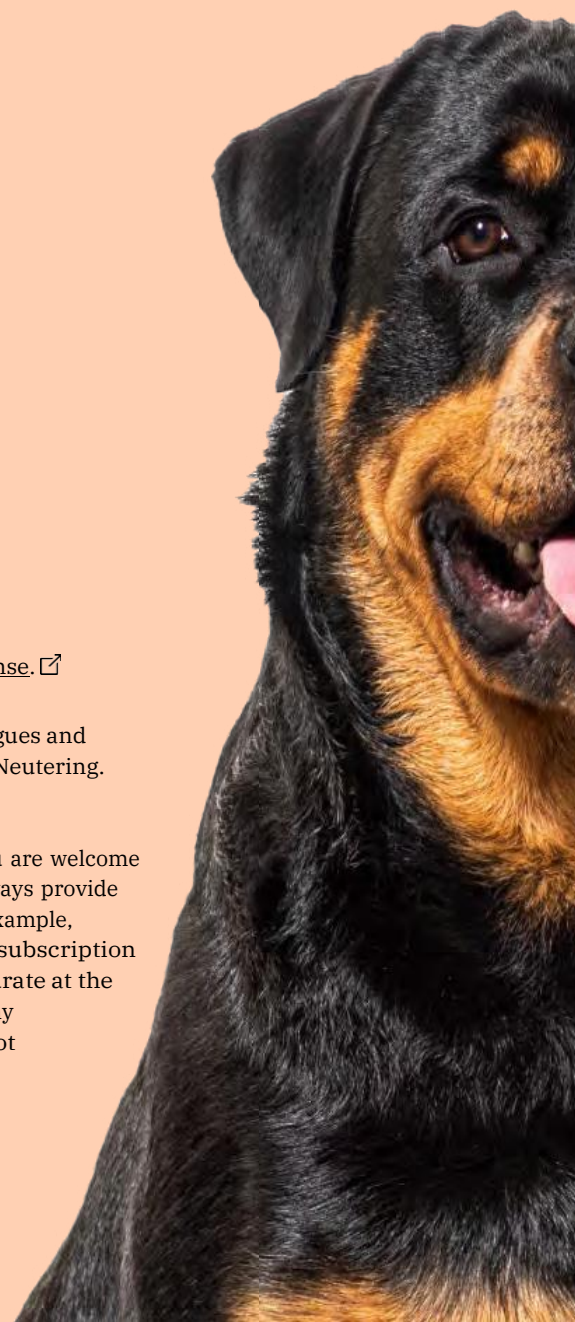
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A MESSAGE FROM OUR CHAIR OF TRUSTEES

The report you're about to read has been two decades in the making, but it started with a simple question. How can we understand neutering outcomes at a national level? That was the key motivation behind the project that was initially known as 'VetAUDIT', launched in 2005. Veterinary teams were invited to submit their data on neutering procedures in dogs and cats to build an evidence base that could help veterinary professionals make evidence-based improvements to the care delivered in practice.

A few things have changed since then, notably that the project was renamed the National Audit for Small Animal Neutering (or NASAN for short) in 2018. However, the core aim of the NASAN has always remained the same: growing the evidence base on neutering procedures in small animals to help clinicians make informed decisions and improve patient safety.

This report contains the data submitted to the NASAN in 2025, marking the 20th anniversary of the project. At such an important milestone, it's worth reflecting on the NASAN, the impact it has had on evidence-based veterinary medicine, and where it could go in future.

Crucially, NASAN is a robust dataset with more than 90,000 neutering procedures logged. Participation is voluntary and the huge volume of data is testament to all those that choose to submit their data – **thank you.**

It is heartening to see the levels of participation we have had over the last 20

years and the commitment to quality improvement among the veterinary professions that this evidences.

This report comes at a time when veterinary professionals have been operating under heightened scrutiny. With the data provided in the NASAN, clinicians can feel confident in the care choices they make regarding neutering, and that together we are consistently working to improve outcomes.

There is also currently an ongoing discussion around the provision of contextualised care. The benchmark data provided in the NASAN has a role to play in such approaches when considered alongside contextual factors that change from patient to patient.

So, what next for the NASAN? In the current landscape, the need for clear, trusted data that can inform clinical decisions has never been more vital. We hope that the NASAN will continue to inspire open conversations between clinicians and owners, and drive evidence-based decisions in the years to come.

If you're not already involved, now is a great time to get started. By auditing and submitting your data on neutering procedures, you can be part of a collaborative effort to ensure the best possible neutering outcomes for small animals everywhere.



Amanda Boag – Chair, board of trustees

1. INTRODUCTION

The National Audit for Small Animal Neutering (NASAN) is a simple audit that enables veterinary teams to measure post-operative complication rates for the neutering of small animals. In this report, spaying typically refers to an ovariohysterectomy, though an ovariectomy may also be used. Castration refers to surgical removal of the testes (orchietomy) as well as cryptorchid castration.

Our free-to-download audit template enables practices to record and evaluate their own data, and where this data is submitted to RCVS Knowledge, practices contribute to the benchmark.

By collating the submitted data, NASAN provides a system to measure national benchmarks for the short-term clinical outcomes of dog, cat, rabbit and guinea pig spays and castrations. The data is cleaned, collated and analysed on an annual basis, and made publicly available to enable practices to compare their rates against the national benchmark.

Using consistent categories across teams enables data to be combined and compared reliably. Based on the Clavien-Dindo classification - a recognised grading system for surgical complications¹ - post-operative outcomes can be selected from five groups:



no abnormality present: healed as normal



abnormal but no treatment necessary: abnormal healing that resolved without any treatments



abnormal requiring medical treatment: abnormal healing that required extra treatment on top of any routinely prescribed post-operative treatments



abnormal requiring surgical intervention: abnormal healing that required additional surgical intervention



fatality: the patient died either in the peri- or post-operative period

Procedures where patients are **lost to follow up** (i.e. those that do not return to the practice when a repeat checkup was expected) are also recorded.

What's new for 2025

In this report, benchmarks have been calculated separately for each procedure type and species to support valid comparison and meaningful insights. Unless otherwise stated, analyses use all available data collected between 2005 and 2025. Results for 2025 are presented separately in the section titled “**2025 Results**” to assess current performance against the benchmark.

¹ Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6,336 patients and results of a survey. *Ann Surg* 2004; 240(2):205-213.

BENCHMARKING

Benchmarking is a quality improvement (QI) tool that can be used to help improve clinical outcomes, complications, and quality of care. A **benchmark** is a set of typical results used as a reference point to show what is normal or expected. The benchmark is derived from data collated across individuals, practices and regions, over multiple years.

Comparing practice audit results against the NASAN benchmark enables veterinary teams to identify variation, highlight strengths and opportunities for improvement, and supports a clearer understanding of differences in outcomes. Benchmarking therefore supports

veterinary teams directly to interpret audit findings, prioritise improvement efforts and monitor changes over time.



ANALYSIS

We have used the Wilson method to describe the level of uncertainty around our results. A 95 percent confidence interval gives the range of values that is likely to contain the true result for the wider population, based on the data we observed. This means that if the same audit were carried out many times using similar groups, the true value would fall within this range in 95 percent of cases.

For example, for the outcome “no abnormality present” for spay procedures in dogs, we

estimate that 75.5 percent of patients would have no abnormalities, but that the expected true range would fall between 75.0 and 76.1 percent.

This approach is recommended for audit and benchmarking work because it provides reliable and realistic ranges for percentage data, particularly when case numbers are small or vary between groups. This helps ensure fair comparison between practices and reduces the risk of over-interpreting random variation.

ACKNOWLEDGEMENTS

RCVS Knowledge would like to thank all practices that have submitted data. Your participation contributes to strengthening the body of evidence and making standards setting possible.

This report was prepared and written by Emma Buckland PhD and Jennifer Marsan-Stott RVN, with editorial support from RCVS Knowledge clinical reviewers – Mark Morton BVSc DSAS(orth) FRCVS, Sally Everitt BVSc MSc(VetGP) PhD MRCVS and Louise Northway RVN. We also thank Deborah Archer BVMS PhD DipECVS FRCVS for her insightful feedback.

Start auditing your post-op neutering today:
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2. AUDIT IN PRACTICE

SHOWCASING THE IMPACT OF THE NASAN

The data for the NASAN is submitted by veterinary professionals across the United Kingdom and Republic of Ireland. Here, QI projects using the NASAN benchmark data are highlighted through RCVS Knowledge Awards². Both projects won Highly Commended in the 2026 RCVS Knowledge Awards for quality improvement in practice.

Sheryl Osaremwinda - Highcliff Veterinary Practice, IVC

Evidensia won Highly Commended (2026) for their review of post-operative complications in dog castrate patients. An initial audit showed that 25% of dogs had post-operative complications after castration, and 15% of cases were missing complication records. After improving their discharge advice, initiating clearer complication grading, and using local anaesthetic blocks, reporting improved, and overall post-operative outcomes were better on re-audit.



“ The NASAN enabled us to have access to a reliable set of data to use as a benchmarking tool. This benefited my team and I, as it provided us with a large compilation of data which we could use to compare our data against” **Sheryl Osaremwinda, RVN, BSc Animal Therapy (Hon), CertAVN**

Mirain Lewis - Bodrwnsiwn Veterinary Group,

VetPartners won Highly Commended (2026) for their audit reviewing post-operative complications. Using the NASAN benchmark, the team identified practical improvements in aseptic protocols, theatre workflow, and client education following routine small animal neutering procedures. These changes resulted in increased uncomplicated recoveries and the elimination of significant post-operative complications on re-audit.



“ Using NASAN for my first clinical audit was a valuable experience. The NASAN encouraged team engagement and demonstrated how clinical audit can lead to meaningful improvements in patient care”. **Mirain Lewis RVN NCert (Mednsg)**

Find out more about our awards
www.rcvsknowledge.org/qi-awards

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NATIONAL BENCHMARK

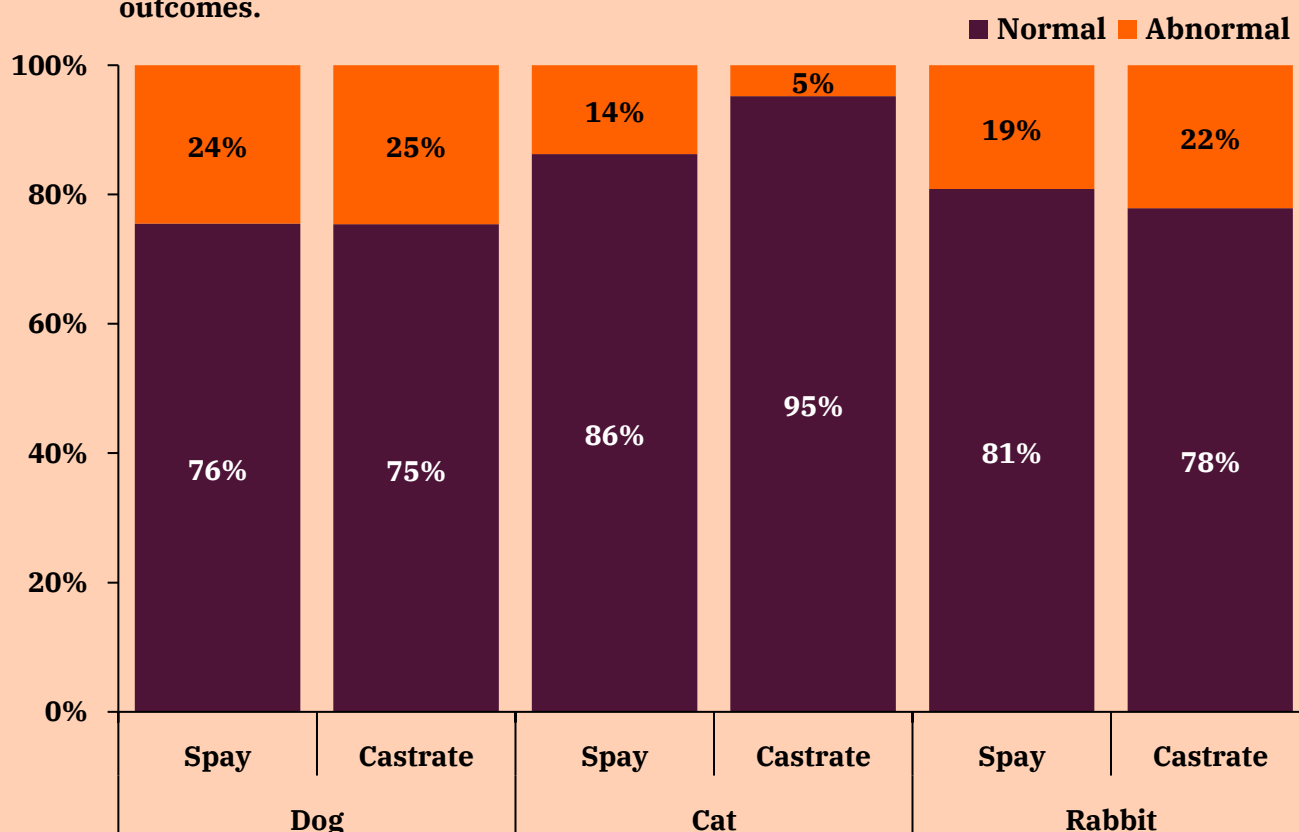
A total of 90,363 procedures were collated between 2005 and 2025, of which 76,222 had known outcomes – 50,214 were spays and 40,149 were castrates. Rabbit data was collected from 2024 onwards.

The national benchmark results per procedure per species are presented below. Procedures that are lost to follow up were excluded from benchmarking as although these patients are important, the outcomes are unknown (see section on lost to follow up).

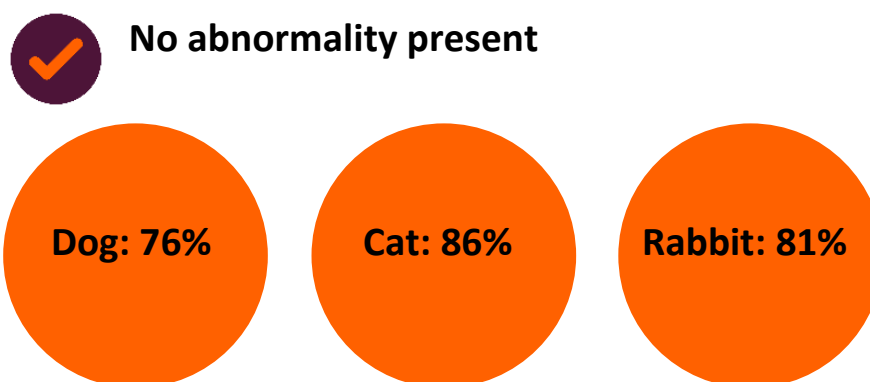
It is important to recognise that the profile of animals (e.g. age, breed) and surgical techniques will have changed over time and that this may affect the level of post-operative complications. Complication rates are influenced by patient and procedural factors such as age, weight, breed type, cryptorchid status, and surgical approach. Differences in case mix between practices and across time mean that direct comparison should be interpreted with caution.

When results are collapsed into normal (no abnormality present) versus abnormal outcomes (**Figure 1**), dogs and rabbits have greater abnormal outcomes than cats across both spay and castrates. When looking at the expanded outcome data in later sections, this is largely explained by a greater proportion of abnormal outcomes with no treatment necessary or requiring medical treatment (**Tables 1 and 2**).

Figure 1. Outcomes for spay and castrate procedures submitted between 2005-2025, where outcomes were known, collapsed into normal (no abnormality present)/abnormal outcomes.



SPAY



Across species, the benchmark for outcomes where no abnormality was present for spay procedures is between 75-86% (**Table 1; Figure 2**). Wilson confidence intervals are larger for rabbits across all outcomes, indicating greater uncertainty around the estimated rate – likely because there are fewer data for rabbit procedures.

Procedures in dogs had more abnormal outcomes compared to cats and rabbits, and this is largely explained by a higher proportion of abnormal outcomes where no treatment was necessary or medical treatment was required (**Figure 2**).

Table 1. Outcomes for spay procedures submitted between 2005 and 2025, where outcomes were known. The expected range is provided based on Wilson confidence intervals.






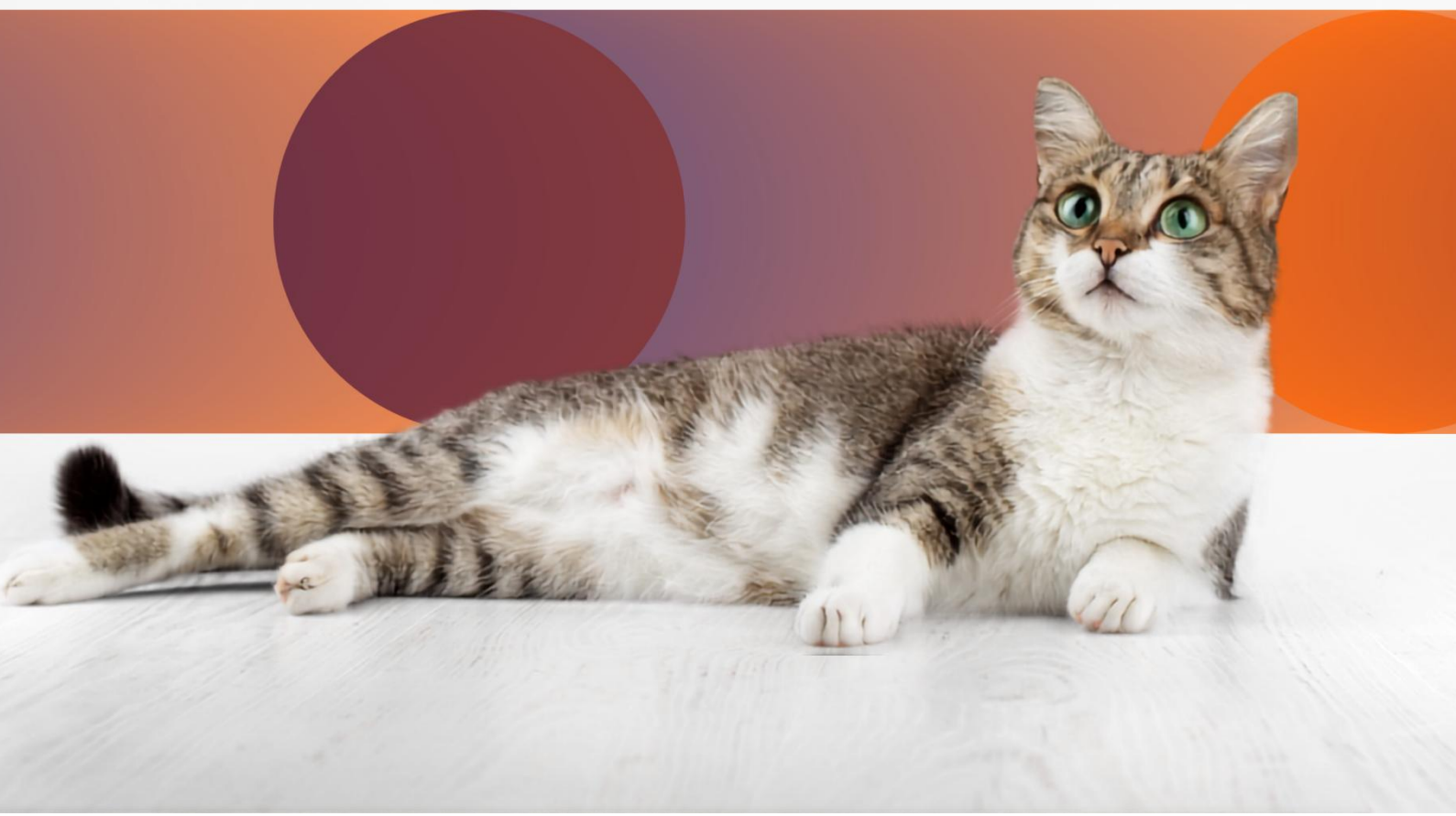
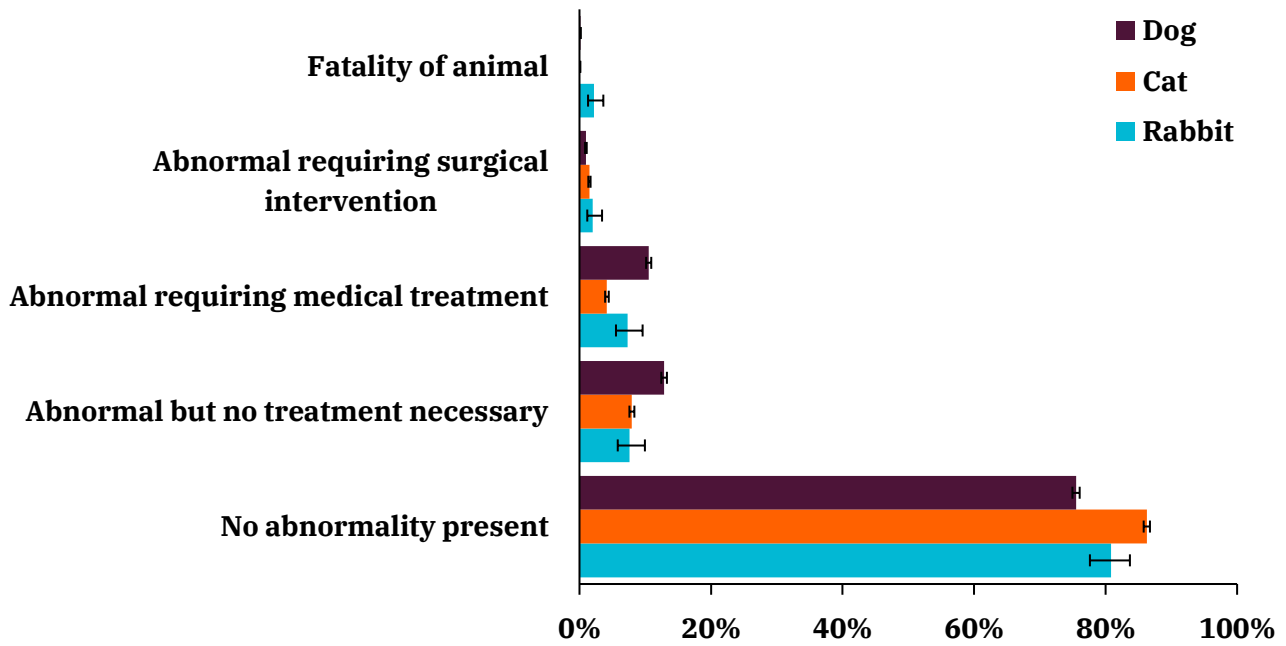
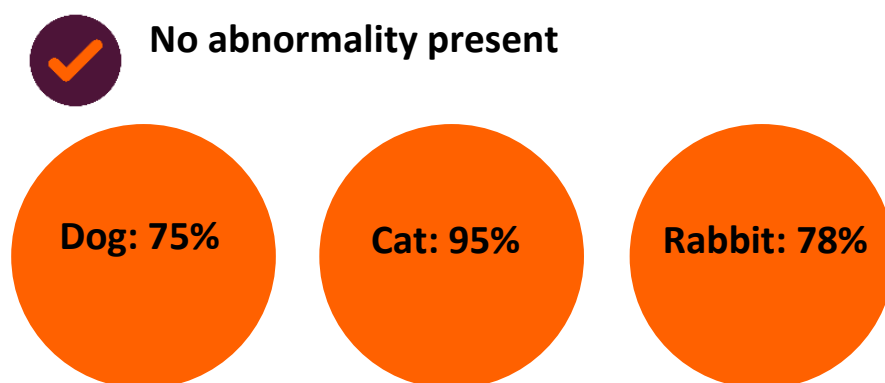
OUTCOMES		DOG n = 23,561	CAT n = 19,966	RABBIT n = 642
	No abnormality present	75.5% 75.0 – 76.1%	86.3% 85.8 – 86.7%	80.8% 77.6 – 83.7%
	Abnormal but no treatment necessary	12.9% 12.4 – 13.3%	8.0% 7.6 – 8.3%	7.6% 5.8 – 9.9%
	Abnormal requiring medical treatment	10.5% 10.1 – 10.9%	4.2% 3.9 – 4.5%	7.3% 5.5 – 9.6%
	Abnormal requiring surgical intervention	1.0% 0.9 – 1.1%	1.5% 1.3 – 1.7%	2.0% 1.2 – 3.4%
	Fatality of animal	0.1% 0.1 – 0.2%	0.1% 0.1 – 0.1%	2.2% 1.3 – 3.6%

Figure 2. Outcomes for spay procedures submitted between 2005 and 2025, where outcomes were known. The error bars represent the expected range, based on Wilson confidence intervals.



CASTRATE



Across species, the benchmark for outcomes where no abnormality was present for castrate procedures is between 75-95% (Table 2; Figure 3). Wilson confidence intervals are larger for rabbits across all outcomes, indicating greater uncertainty around the estimated rate – likely because there are fewer data for rabbit procedures.

Procedures in cats had lower abnormal outcomes compared to dogs and rabbits (Figure 3).

Table 2. Outcomes for castrate procedures submitted between 2005 and 2025, where outcomes were known. The expected range is provided based on Wilson confidence intervals.






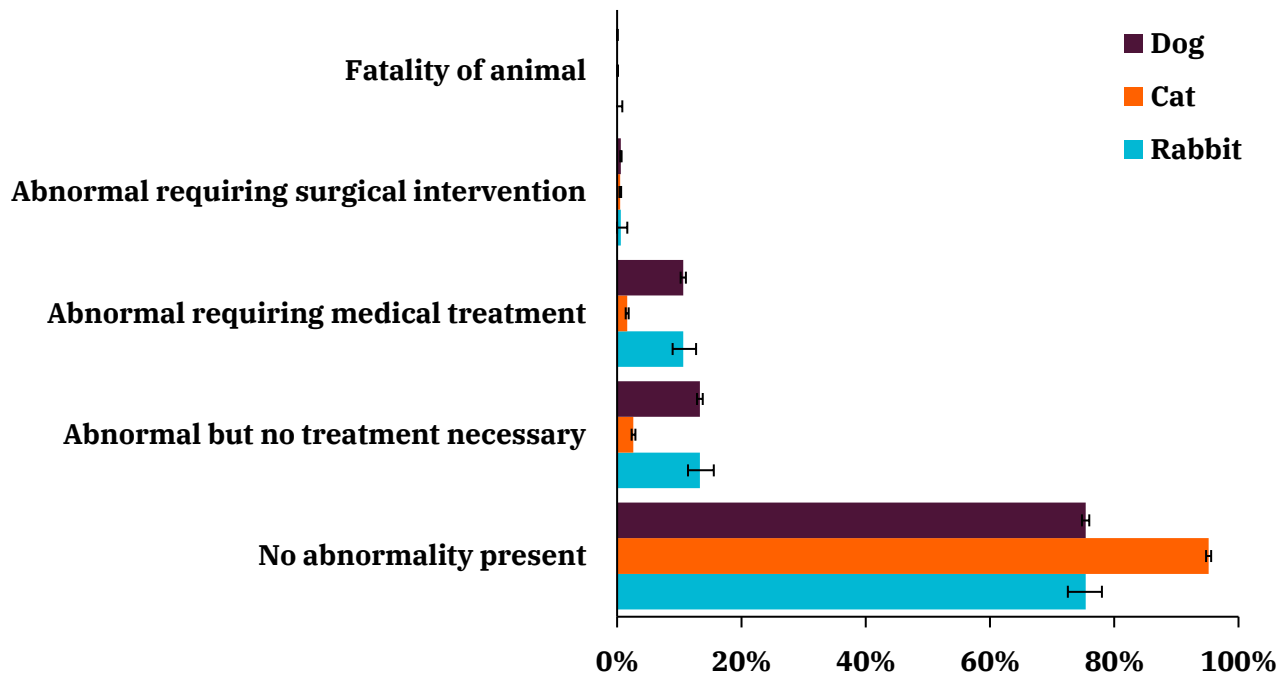
OUTCOMES		DOG n = 20,655	CAT n = 10,520	RABBIT n = 878
	No abnormality present	75.4% 74.8 – 76.0%	95.2% 94.8 – 95.6%	77.9% 75.0 – 80.5%
	Abnormal but no treatment necessary	13.3% 12.9 – 13.8%	2.6% 2.3 – 2.9%	11.1% 9.1 – 13.3%
	Abnormal requiring medical treatment	10.6% 10.2 – 11.1%	1.6% 1.4 – 1.9%	8.9% 7.2 – 10.9%
	Abnormal requiring surgical intervention	0.6% 0.5 – 0.7%	0.5% 0.4 – 0.6%	1.5% 0.9 – 2.5%
	Fatality of animal	<0.0% <0.0 – 0.1%	0.1% <0.0 – 0.1%	0.7% 0.3 – 1.5%

Figure 3. Benchmark outcomes for castrate procedures where outcomes were known, submitted between 2005 and 2025. The error bars represent the expected range, based on Wilson confidence intervals.



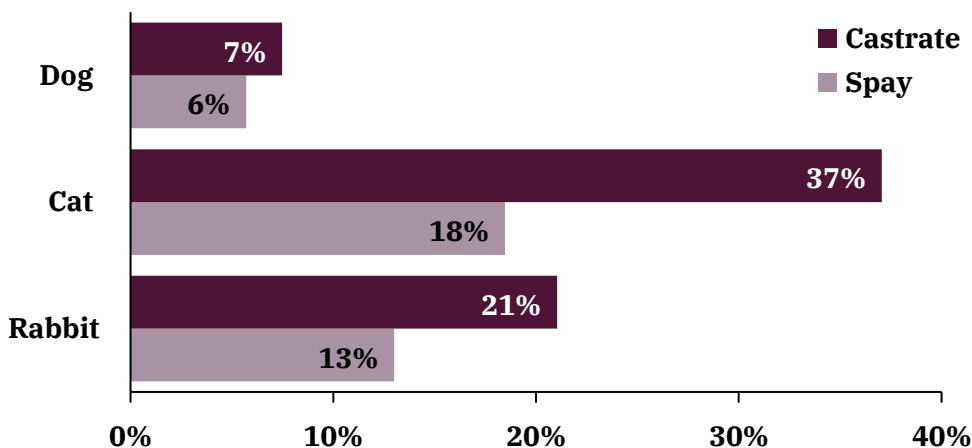
LOST TO FOLLOW UP

Loss to follow up is an important measure because it affects how confidently clinical outcomes can be interpreted. Where follow-up data is lost, reported outcome rates may underestimate complications, making it more difficult to understand the true quality of care. Monitoring loss to follow up locally helps teams reflect on data completeness, identify potential bias and improve follow up processes over time.



The overall percentage of procedures lost to follow up within the benchmark period (2005-2025) was 12% for spays and 20% for castrates, with greater loss to follow up observed for cats and rabbits and for castrate procedures overall (**Figure 4**).

Figure 4. The percentage of procedures, submitted between 2005-2025, that were lost to follow up.



3. 2025 RESULTS – COMPARISON TO THE BENCHMARK

In this section, we present the 2025 audit data, for 9,854 procedures, of which 7,559 had known outcomes – 5,615 were spays and 4,239 were castrates.

SPAY IN 2025

From a total of 4,666 spays in 2025 where outcome was known, the result for where no abnormality was present is between 81-87% (**Table 3; Figure 5**). Wilson confidence intervals are generally larger for 2025 outcomes – especially for rabbits – indicating greater uncertainty around the estimated rate, likely

because there are fewer data compared to the benchmark.

Procedures in dogs had more abnormal outcomes compared to cats and rabbits, and this is largely explained by a higher proportion of abnormal outcomes where no treatment was necessary or medical treatment was required (**Figure 5**).

Table 3. Proportion of known outcomes from 2025 spay procedures, including the expected range based on Wilson confidence intervals.






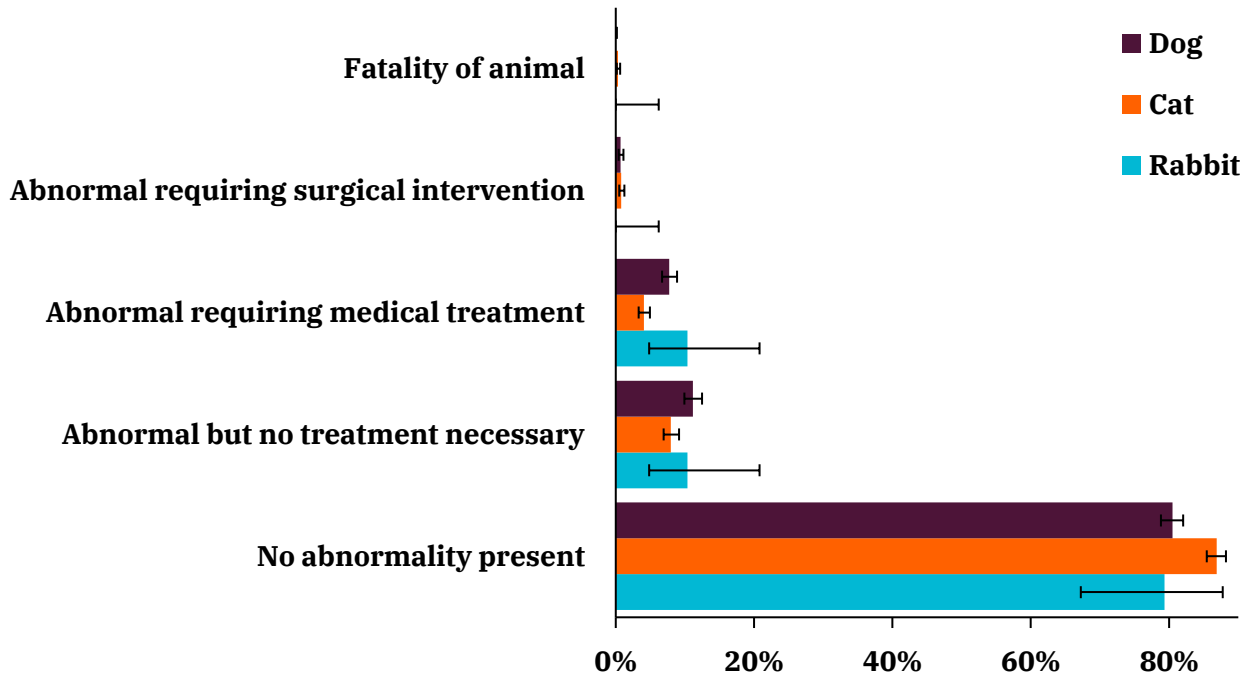
2025 OUTCOMES		DOG n = 2,335	CAT n = 2,273	RABBIT n = 58
	No abnormality present	80.5% 78.8 – 82.0%	86.9% 85.4 – 88.2%	79.3% 67.2 – 87.7%
	Abnormal but no treatment necessary	11.1% 9.9 – 12.5%	8.0% 6.9 – 9.1%	10.3% 4.8 – 20.8%
	Abnormal requiring medical treatment	7.7% 6.7 – 8.9%	4.0% 3.3 – 4.9%	10.3% 4.8 – 20.8%
	Abnormal requiring surgical intervention	0.7% 0.4 – 1.1%	0.8% 0.5 – 1.2%	<0.0% 0.0 – 6.2%
	Fatality of animal	<0.0% 0.0 – 0.2%	0.3% 0.1 – 0.6%	<0.0% 0.0 – 6.2%

Figure 5. Outcomes for spay procedures in 2025 where outcomes were known. The error bars represent the expected range, based on Wilson confidence intervals.



CASTRATE IN 2025

From a total of 4,239 spays in 2025 where outcome was known, the result for where no abnormality was present is between 73-95% (Table 4; Figure 6). Wilson confidence intervals are generally larger for 2025 outcomes – especially for rabbits – indicating greater

uncertainty around the estimated rate, likely because there are fewer data compared to the benchmark.

Procedures in cats had lower abnormal outcomes compared to dogs and rabbits (Figure 6).

Table 4. Outcomes for castrate procedures in 2025 where outcomes were known. The error bars represent the expected range, based on Wilson confidence intervals.






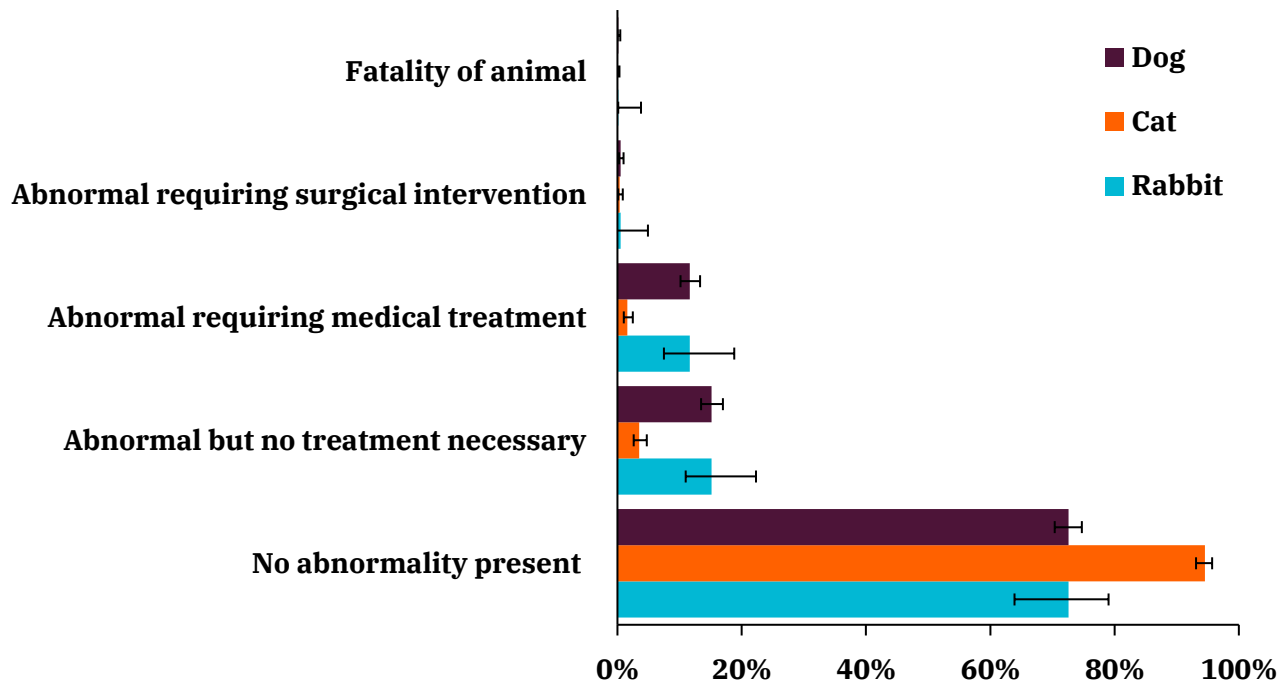
2025 OUTCOMES		DOG n = 1,599	CAT n = 1,193	RABBIT n = 101
	No abnormality present	72.6% 70.4 – 74.7%	94.6% 93.1 – 95.7%	81.2% 72.5 – 87.6%
	Abnormal but no treatment necessary	15.1% 13.5 – 17.0%	3.5% 2.6 – 4.7%	8.9% 4.8 – 16.1%
	Abnormal requiring medical treatment	11.6% 10.2 – 13.3%	1.6% 1.0 – 2.5%	8.9% 4.8 – 16.1%
	Abnormal requiring surgical intervention	0.5% 0.3 – 1.0%	0.3% 0.1 – 0.9%	1.0% 0.2 – 5.4%
	Fatality of animal	0.1% 0.0 – 0.5%	<0.0% 0.0 – 0.3%	<0.0% 0.0 – 3.7%

Figure 6. Outcomes for castrate procedures in 2025 where outcomes were known. The error bars represent the expected range, based on Wilson confidence intervals.

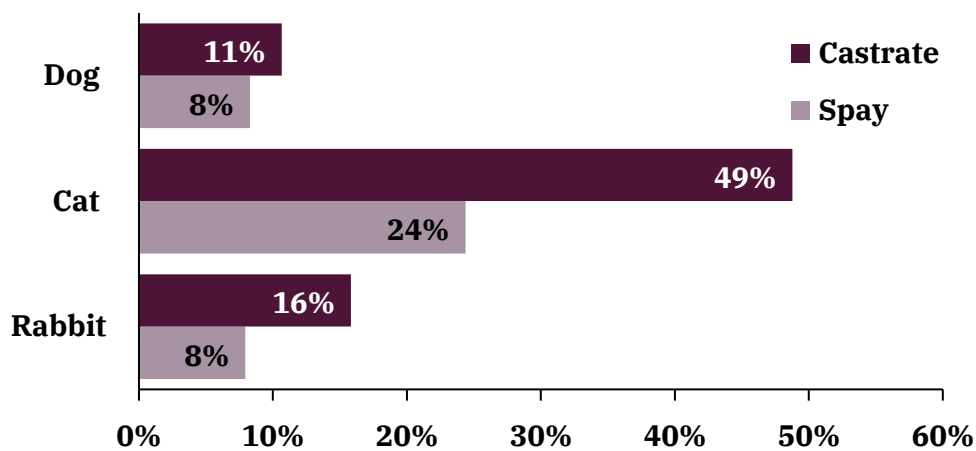


LOST TO FOLLOW UP IN 2025

The overall percentage of procedures lost to follow up during 2025 was 17% for spays and 32% for castrates. Greater loss to follow up is observed for cats and rabbits and for castrate procedures overall (**Figure 7**).



Figure 7. Percentage of 2025 procedures that were lost to follow up.



4. DOG

This section summarises all recorded procedures for dogs between 2005 and 2025.

DEMOGRAPHICS

A total of 47,312 procedures were submitted for dogs, of which 53% were spays (**Table 5**).

Table 5. Number of dog procedures across all time (2005-2025), including those that were lost to follow up (expressed as a percentage of procedures), cases with weight recorded (expressed as a percentage of procedures), and average weight.

2005-2025 data	Procedures	Lost to follow up	Weight recorded	Average weight
Bitch spay	24,986	1,425 (6%)	3,162 (13%)	16.5 kg
Castrate	22,326	1,671 (7%)	2,147 (10%)	21.9 kg

Where a known breed was recorded (4,802), the most common breeds were:



Labrador retriever



Cocker spaniel



Cockapoo



Dachshund



French bulldog



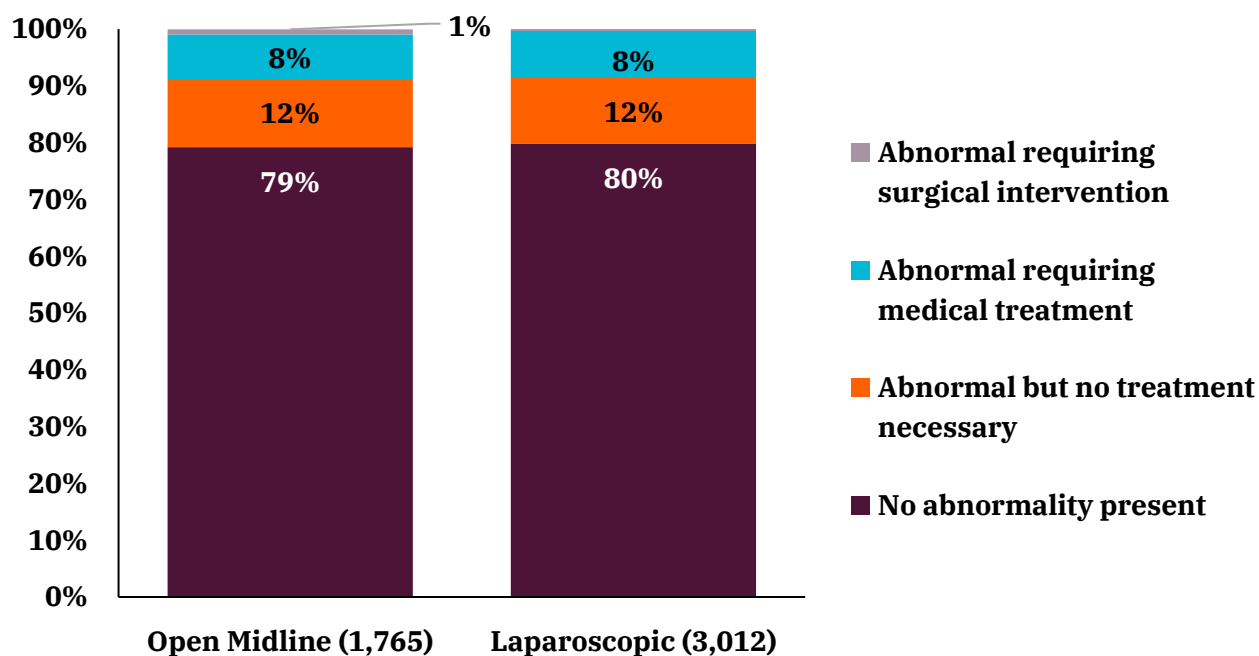
OUTCOMES BY SURGICAL APPROACH

Recording of surgical approach began in 2024. The numbers reported in this section are extremely limited, and further data is required to increase confidence in these figures.

SPAY

Outcomes are provided in **Figure 8**, where outcome and surgical approach (midline or laparoscopic only) were known (4,777). No abnormalities were present for 80% of laparoscopic bitch spays, and 79% in open midline spays.

Figure 8. Outcomes for data by surgical approach for bitch spays where outcome and surgical approach was known. Zero values are not presented. One fatality (open midline; 0.1%) was recorded (not presented).



CASTRATE

Outcomes are provided in **Figure 9**, where outcome and surgical approach were known (open, closed, open-closed only; 4,777). No abnormalities were present for 79% of open-closed procedures, compared to 73% for open and 75% for closed castrates.

Figure 9. Outcomes for data by surgical approach for dog castrates, where outcome and surgical approach was known. Zero values are not presented. Two fatalities (closed; 0.2%) were recorded (not presented).

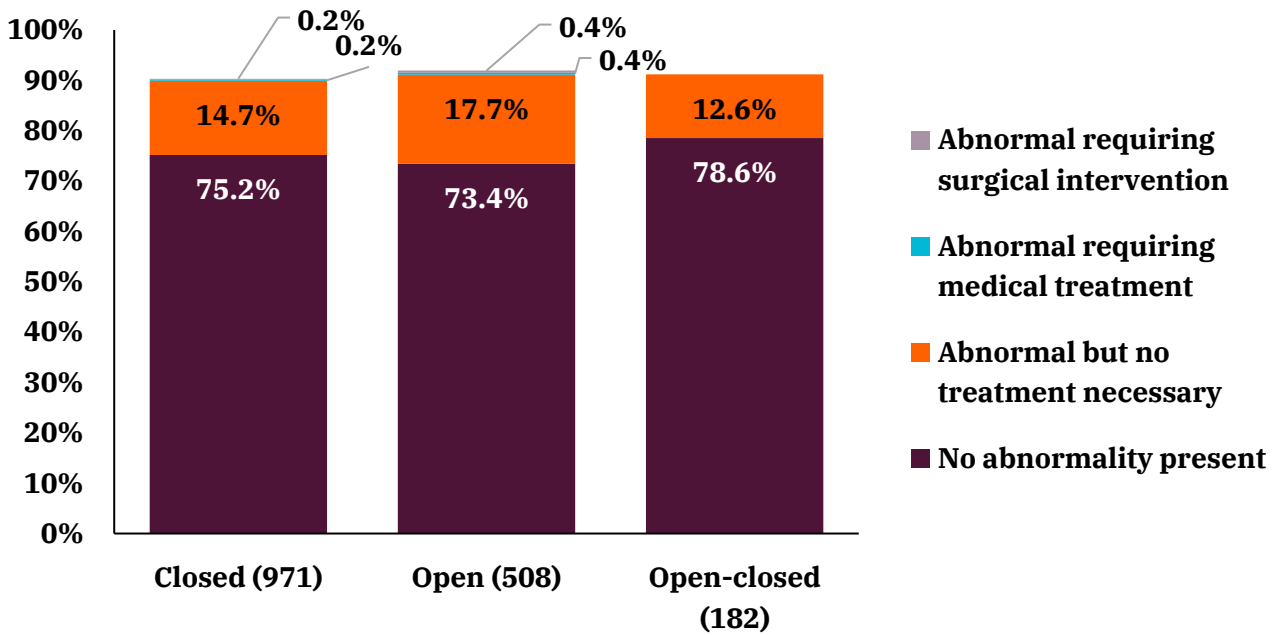
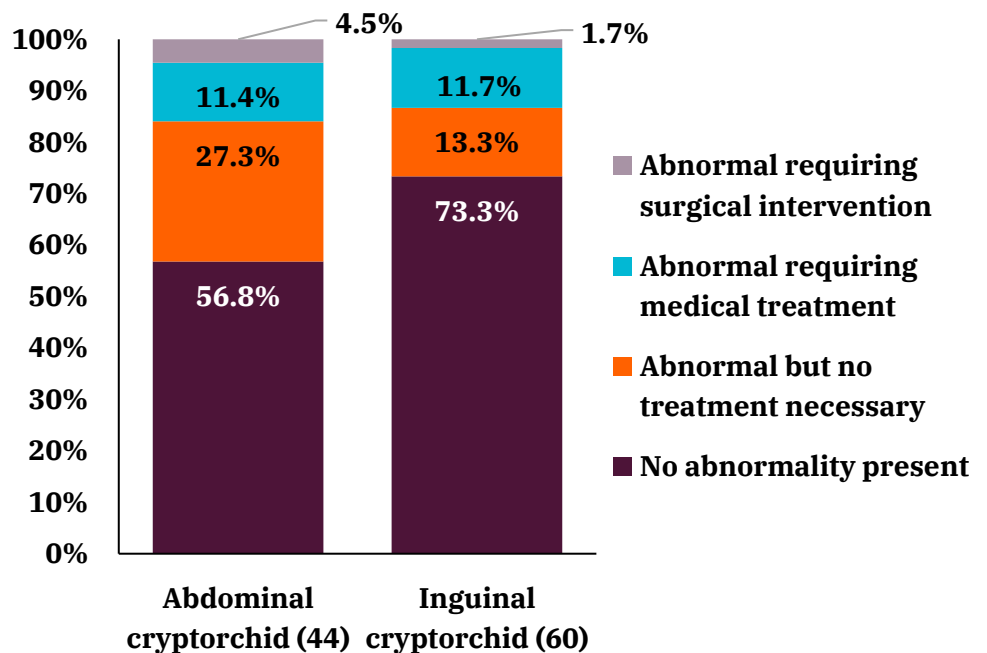


Figure 10. Outcomes for cryptorchid dog castration procedures, where outcomes and cryptorchid status were known. Zero values are not presented. Two fatalities (closed; 0.21%) were recorded (not presented).

In addition, 104 procedures were recorded as cryptorchid (**Figure 10**). No abnormalities were present for 73% of inguinal cryptorchid and 57% for abdominal cryptorchid procedures.



5. CAT

This section summarises all recorded cases for cats between 2005 and 2025.

DEMOGRAPHICS

A total of 41,201 procedures for cats were submitted, of which 59% were spays (**Table 6**).

Table 6. Number of cat procedures across all time (2005-2025) including those that were lost to follow up (expressed as a percentage of procedures), cases with weight recorded (expressed as a percentage of procedures), and average weight.

2005-2025 data	Procedures	Lost to follow up	Weight recorded	Average weight
Spay	24,490	4,524 (18%)	3,405 (14%)	2.8 kg
Castrate	16,711	6,191 (37%)	3,083 (18%)	3.4 kg

Where a known breed was recorded (6,454), the most common breeds were:



Domestic short hair



Domestic long hair



British short hair



Ragdoll



Domestic medium hair



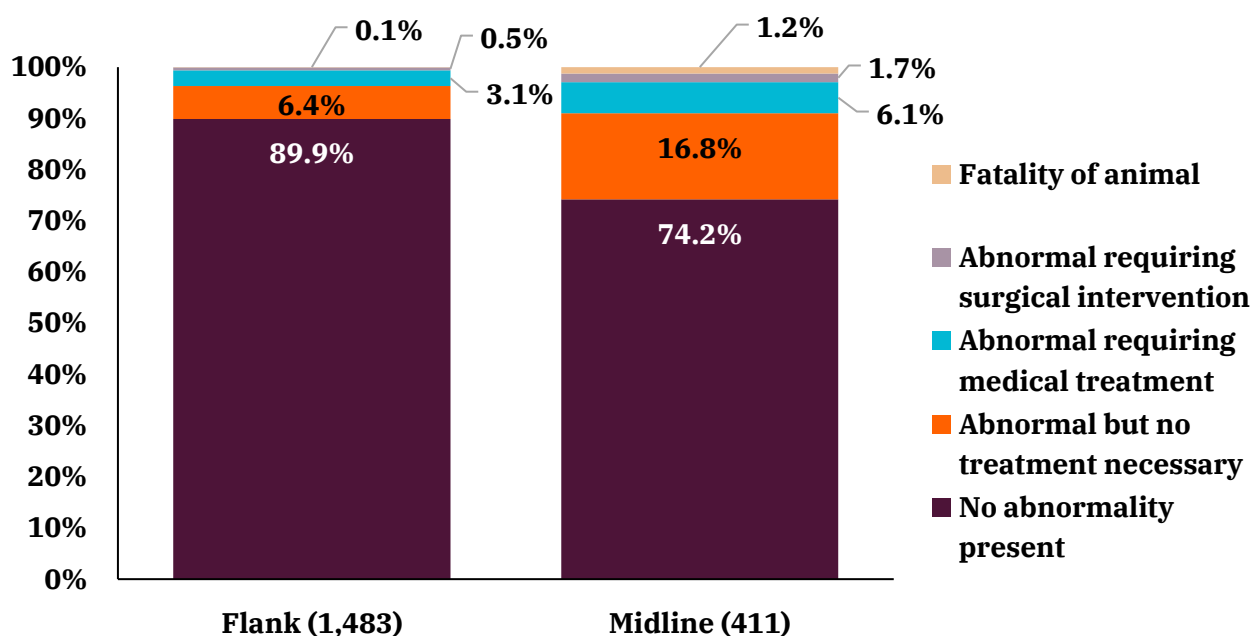
OUTCOMES BY SURGICAL APPROACH

Recording of surgical approach began in 2024. The numbers reported in this section are extremely limited, and further data is required to increase confidence in these figures.

SPAY

Outcomes are provided in **Figure 11**, where outcome and surgical approach (flank or midline) were known (1,894). No abnormalities were present for 90% of flank spays, and 74% in midline spays.

Figure 11. Outcomes for data by surgical approach for cat spays, where outcome and surgical approach was known. Zero values are not presented.



CASTRATE

Outcomes are provided in **Figure 12**, where outcome and surgical approaches were known (open, closed only; 1,298). No abnormalities were present for 98% of closed and 95% for open castrates.

Figure 12. Outcomes for data for cat castrate surgical approach where outcome and surgical approach was known. Zero values are not presented.

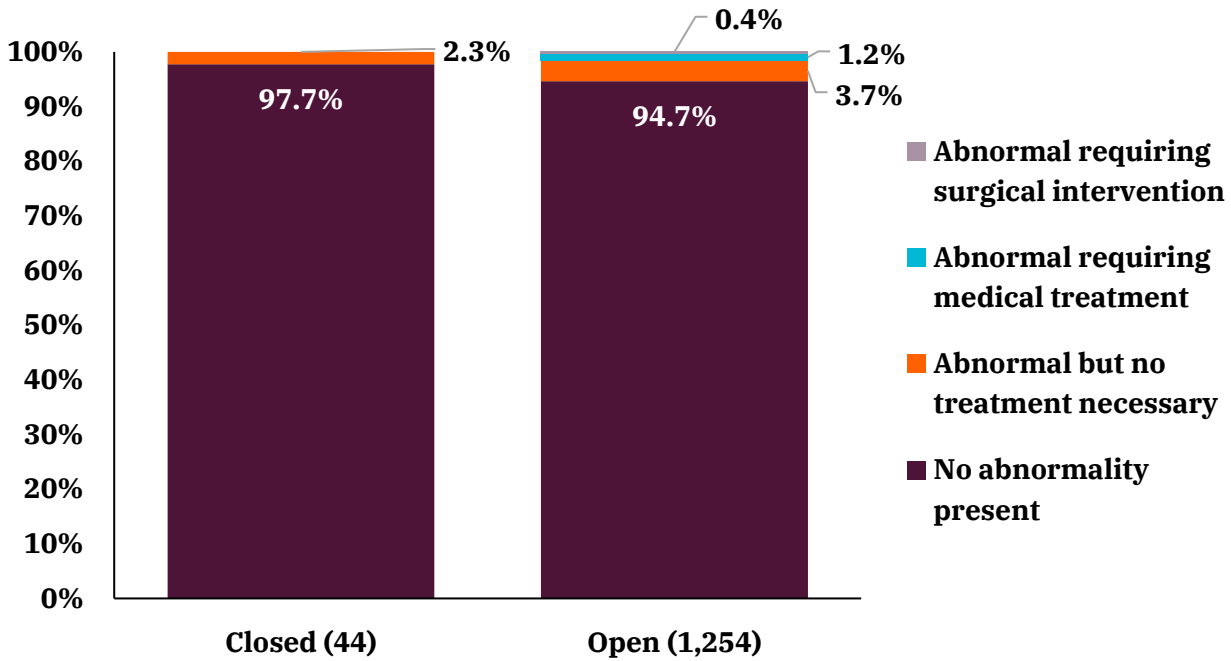
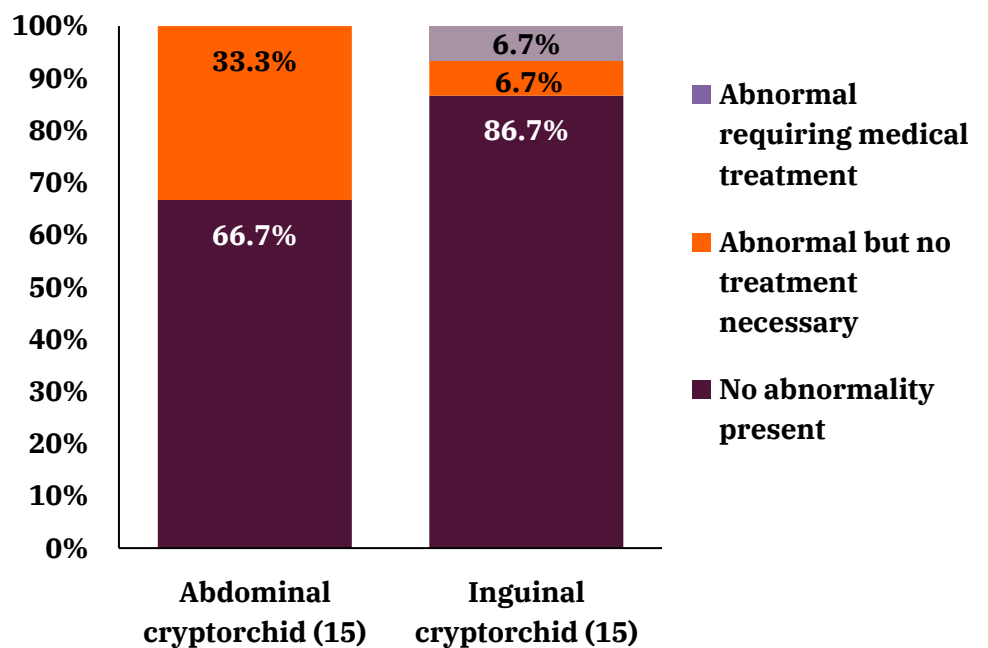


Figure 13. Outcomes for data for cryptorchid castrates where outcome and cryptorchid status was known. Zero values are not presented.

In addition, 30 procedures were recorded as cryptorchid (**Figure 13**). No abnormalities were present for 87% of inguinal cryptorchid and 67% for abdominal cryptorchid procedures.



6. RABBIT

This section summarises all recorded cases for rabbits – we hold data for rabbit procedures from 2012 onwards.

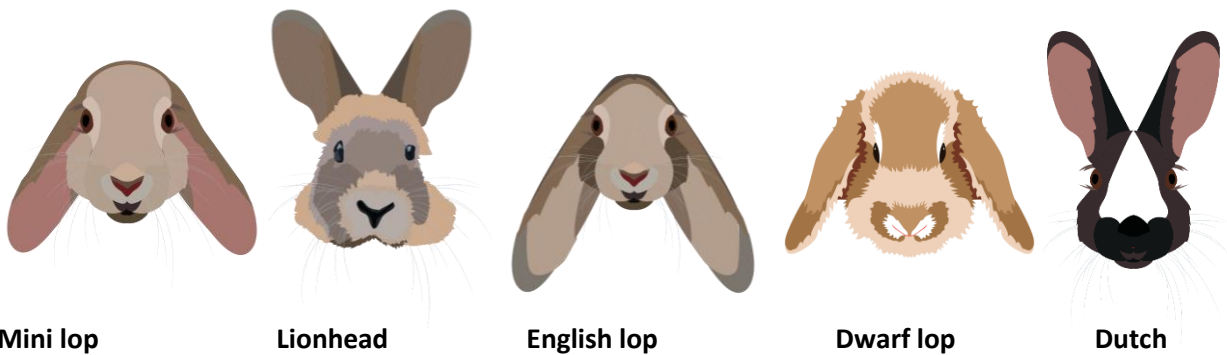
DEMOGRAPHICS

A total of 1,850 procedures for rabbits were submitted, of which 60% were castrates (**Table 7**).

Table 7. Number of rabbit procedures across all time (2012-2025), including those that were lost to follow up (expressed as a percentage of procedures), cases with weight recorded (expressed as a percentage of procedures) and average weight.

2005-2025 data	Procedures	Lost to follow up	Weight recorded	Average weight
Rabbit spay	738	96 (13%)	68 (9%)	1.9 kg
Rabbit castrate	1,112	234 (21%)	112 (15%)	1.9 kg

Where a known breed was recorded (138), the most common breeds were:



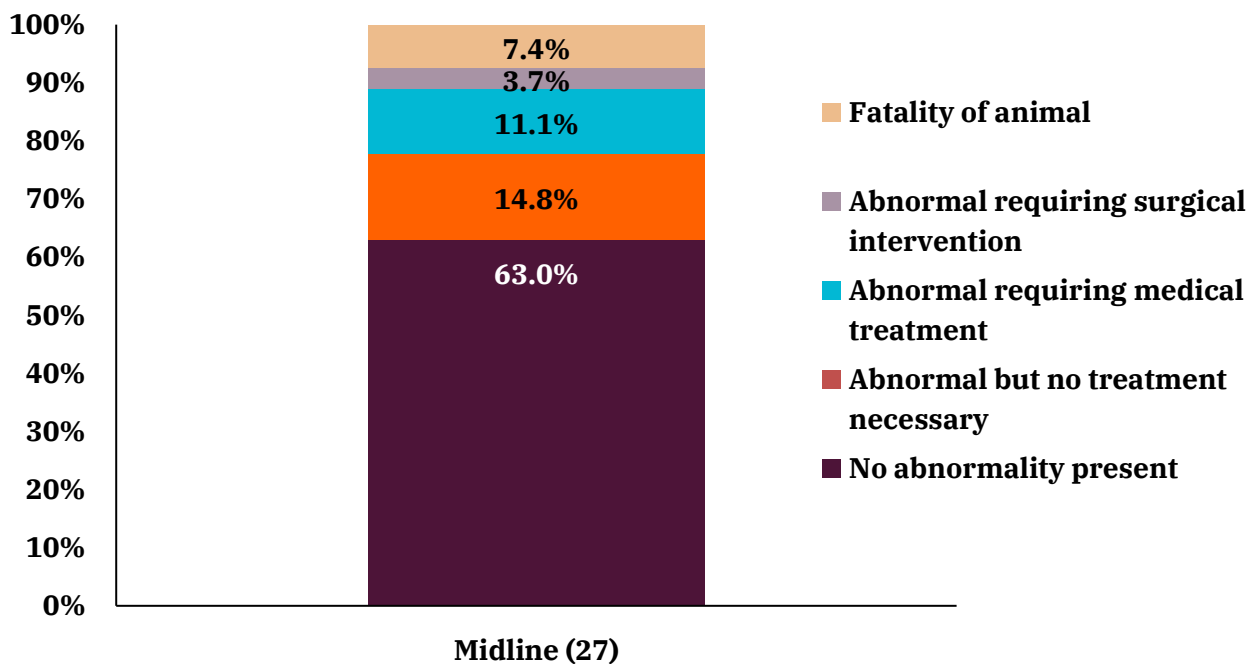
OUTCOMES BY SURGICAL APPROACH

Recording of surgical approach began in 2024. The numbers reported in this section are extremely limited, and further data is required to increase confidence in these figures.

SPAY

Surgical approach for rabbit spays were known in 27 procedures only (midline; **Figure 14**). No abnormalities were present for 63% of midline spays.

Figure 14. Outcomes for data for rabbit spays, where outcome and surgical approach was known.

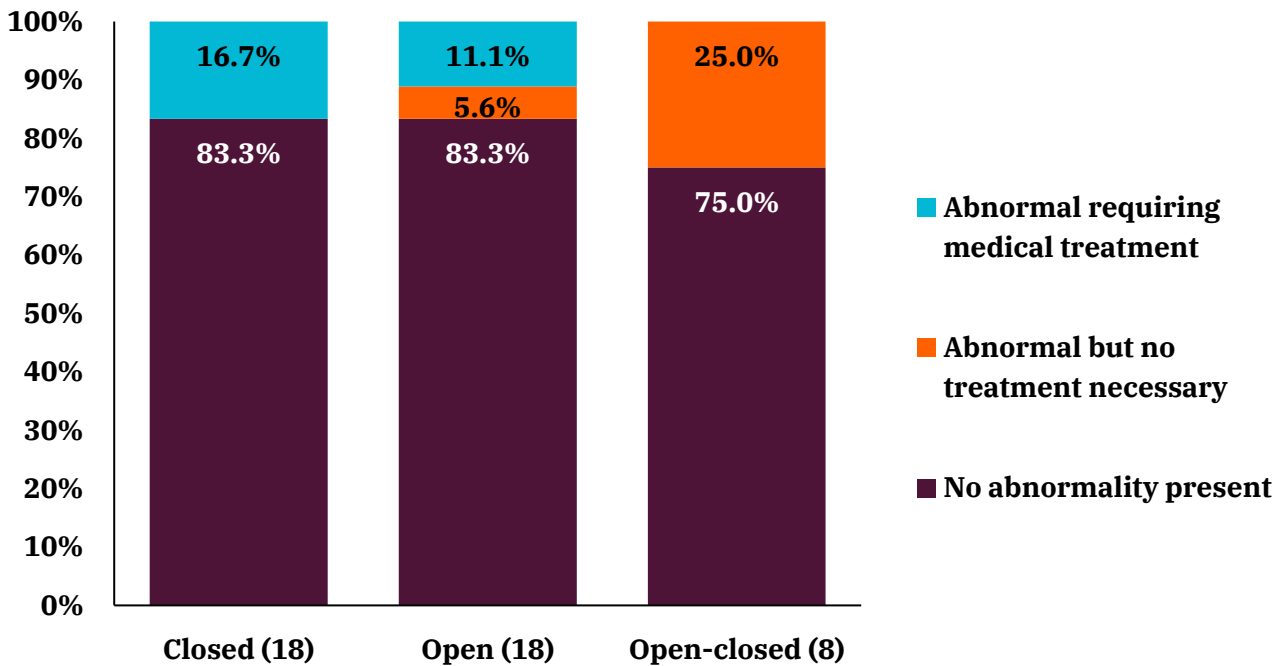


CASTRATE

Surgical approach in rabbit castrates was recorded for 44 procedures only (**Figure 15**). No abnormalities were present for 83% of closed and open castrates, and 75% for open-closed castrates.



Figure 15. Outcomes for data for rabbit castrates, where outcome and surgical approach was known.



7. WHAT'S NEXT?

RESOURCE HUB

Discover resources to help you improve patient outcomes for the neutering of small animals.

The **NASAN resource hub** supports veterinary teams to translate audit findings into measurable improvements in patient care. Linked directly to the NASAN outcome categories, it brings together trusted, evidence-based resources, practical tools and real-world case examples. These resources can help guide teams from insight to action and encourage reflection and learning.

A dedicated rabbit-specific section recognises the importance of species-appropriate evidence, and supports improved perioperative care for rabbits, an area where tailored guidance is particularly valuable.

Access the resource hub

rcvsknowledge.org/nasan-resource-hub/

TRACK YOUR PROGRESS

Compare your data with the national benchmark or 2025 results to help guide your discussions.

You can use the NASAN discussion guide poster to display and talk about your results at your next QI meeting.

rcvsknowledge.org/NASAN-guide

QUALITY IMPROVEMENT AWARDS

Have you made changes within practice that have improved your outcomes? We want to hear about it and share your success!

The RCVS Knowledge Quality Improvement Awards showcase the implementation of QI techniques which drive improvement in veterinary care.

Applications must demonstrate how recognised QI techniques have been used to achieve measurable improvements in their area of work.

Find out more and apply for the
RCVS Knowledge Quality
Improvement Awards
rcvsknowledge.org/awards

CONTRIBUTE TO THE NASAN

Ongoing participation in NASAN is important – each data submission strengthens national benchmarking, improves the quality of shared learning and helps veterinary teams to collectively raise standards of neutering care.

Data can be submitted using our Excel spreadsheet template, or by contacting us at evbm@rcvsknowledge.org. Data can be submitted at any time, regularly or in bulk, and will contribute to future benchmarking for the veterinary profession.

Submit your data
today!

[rcvsknowledge.org/NASAN-
submit](https://rcvsknowledge.org/NASAN-submit)

**RCVS Knowledge would like to
thank all the veterinary
professionals and practices
who have contributed data to
the National Audit for Small
Animal Neutering**



Our mission is to advance the quality of veterinary care for the benefit of animals, the public and society.

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