



# Short Communication

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## Diagnostic testing in first opinion small animal consultations

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DIAGNOSTIC testing is a vital part of the decision-making process, which aims to increase diagnostic certainty, assist management and treatment decisions and provide a prognosis (Radostits and others 2000). A wide range of tests are available, with variable accuracy, expense and risk to the patient, but it is currently unclear how veterinary surgeons are making decisions about which tests to carry out. Understanding the decision-making process is vital in order to ensure that the decisions made during the consultation are based on the best relevant evidence. However, before decision-making around diagnostic testing can be understood, it is necessary to know which tests are performed most frequently. This may be useful for veterinary practices, for example, when making business decisions surrounding diagnostic equipment and in-house training, and could also help direct veterinary curricula and research.

The aim of this study was to describe the diagnostic tests commonly performed in a convenience sample of first opinion small animal consultations.

Data collection took place over 16 weeks (two weeks each in eight different practices) as part of data gathered for a larger project (Robinson and others 2014a). A previously developed data collection tool (Robinson and others 2014a) was used to record consultation data by direct observation. Data were recorded on all health problems discussed, including the reason for presentation (the presenting problem) and all additional problems discussed (non-presenting problems). For each health problem discussed, the type of diagnostic test(s) was recorded by selecting one option from: None; In-consultation; Post-consultation; Both. Clinical examination, as defined by Robinson and others (2014b), was not considered to be a diagnostic test; however, additional procedures, such as the measurement of body temperature and ophthalmoscopy, were considered to be diagnostic tests. Tests were coded as in-consultation if the results were available before the end of the consultation and therefore able to influence decision-making in that consultation, for example, ophthalmoscopy. Tests were coded as post-consultation if the test was performed following the consultation or if results were not yet available at the end of the consultation, for

example, radiography. An open field was used to record the specific diagnostic test(s) performed for each problem. Descriptive statistics were carried out using IBM SPSS V.21 with pivot tables used to generate frequency data. Where data are reported for individual species, only data for the three most frequently presented species are shown. The chi-squared test was used to compare categorical variables such as comparing types of diagnostic tests performed between species. Statistical significance was set at the 0.05 level. Ethical approval was obtained from the ethics committee at the School of Veterinary Medicine and Science, The University of Nottingham.

A total of 1901 patients were presented with 3206 health problems discussed. Data on whether diagnostic tests were performed were complete for 98.3% (n=3150) of problems. No tests were performed for the majority of problems (n=2252/3150; 71.5%). In-consultation tests only (n=561/3150; 17.8%) were performed more frequently than post-consultation tests only (n=244/3150; 7.7%). A combination of in-consultation and post-consultation tests was used in a small number of consultations (n=93/3150; 3.0%). The measurement of body temperature was the most common in-consultation test (n=289/3150; 9.2%), while blood tests were the most frequent post-consultation test (n=194/3150; 6.2%; Table 1).

Of the 3150 problems for which diagnostic test data were complete, 1194 were presenting problems and 1956 were non-presenting problems. In-consultation tests only were carried out more frequently for presenting problems (n=406/1194; 34.0%) than non-presenting problems (n=155/1956; 7.9%) and a similar trend was seen for post-consultation tests only (presenting problems: n=158/1194, 13.2%; non-presenting problems: n=86/1956; 4.4%) (P<0.001).

Data on diagnostic testing were complete for 2131 problems in dogs, 864 problems in cats and 99 problems in rabbits (the three most frequently presented species). In-consultation tests only were performed most frequently for rabbits (n=22/99; 22.2%) followed by dogs (n=404/2131; 19.0%) then cats (n=130/864; 15.0%) and post-consultation tests only were performed most frequently in cats (n=94/864; 10.9%) followed by dogs (n=146/2131; 6.9%) then rabbits (n=2/99; 2.0%) (P<0.001). Otoscopy, rectal examinations and lameness examinations were performed more frequently in dogs, while the measurement of body temperature, urinalysis and blood tests were performed in a higher proportion of cats (Table 2). A narrower range of diagnostic tests were performed in rabbits.

The low rate of diagnostic testing is consistent with previous findings (Evans and others 1974). It may be that history-taking and clinical examinations are considered more useful during the diagnostic process (Radostits and others 2000). A wide range of different tests were conducted suggesting test availability may not be an issue. In-consultation tests were performed more frequently than post-consultation tests, suggesting diagnostic tests are often used to aid immediate decision-making during the consultation.

The higher proportion of presenting problems receiving a diagnostic test may reflect a tendency for veterinary surgeons to prioritise these problems over non-presenting problems. Alternatively, it could be that problems viewed as more urgent or inconvenient to owners are more likely to be raised as a presenting problem, so owners may be more willing to consent to diagnostic testing. Previous research has suggested that presenting problems are different from non-presenting problems in terms of common clinical signs, clinical examination findings and body system affected (Robinson and others 2014c), which could also explain the different rates of testing. The differences seen between species could be due to the feasibility of different tests or could reflect the differing common clinical presentations between species. For example, the finding that lameness

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**TABLE 1: The 10 most frequently performed in-consultation and post-consultation diagnostic tests for all specific health problems, presenting problems and non-presenting problems during direct observation of small animal consultations**

Problems	Total n	In-consultation diagnostic tests			Post-consultation diagnostic tests		
		Test	n	%*	Test	n	%*
All	3150	Temperature†	289	9.2	Blood test	194	6.2
		Otoscopy	115	3.7	Radiography	47	1.5
		Ophthalmoscopy	80	2.5	Urinalysis	46	1.5
		Rectal examination	63	2.0	Ultrasound	26	0.8
		Fluorescein stain	49	1.6	Histopathology	19	0.6
		Urinalysis	30	1.0	Swab (c+s)‡	13	0.4
		Schirmer tear test	20	0.6	Fine needle aspirate	8	0.3
		Lameness examination	17	0.5	Swab (in-house)§	7	0.2
		Fine needle aspirate	16	0.5	Faecal examination	7	0.2
		Oral examination¶	15	0.5	Endoscopy	6	0.2
Presenting	1194	Temperature†	259	21.7	Blood test	127	10.6
		Otoscopy	68	5.7	Radiography	41	3.4
		Ophthalmoscopy	52	4.4	Urinalysis	27	2.3
		Fluorescein stain	42	3.5	Histopathology	19	1.6
		Rectal exam	38	3.2	Ultrasound	18	1.5
		Urinalysis	21	1.8	Swab (c+s)‡	11	0.9
		Schirmer tear test	14	1.2	Fine needle aspirate	8	0.7
		Blood test	12	1.0	Swab (in-house)§	7	0.6
		Fine needle aspirate	12	1.0	Endoscopy	6	0.5
		Lameness examination	11	0.9	Faecal examination	6	0.5
Non-presenting	1956	Otoscopy	47	2.4	Blood test	67	3.4
		Temperature†	30	1.5	Urinalysis	19	1.0
		Ophthalmoscopy	28	1.4	Ultrasound	8	0.4
		Rectal examination	25	1.3	Radiography	6	0.3
		Urinalysis	9	0.5	Impression smear	3	0.2
		Fluorescein stain	7	0.4	Blood pressure	2	0.1
		Lameness exam	6	0.3	Swab (c+s)‡	2	0.1
		Oral examination¶	6	0.3	Exploratory surgery	1	0.1
		Schirmer tear test	6	0.3	Faecal examination	1	0.1
		Fine needle aspirate	4	0.2	Fungal culture	1	0.1

\*Percentages shown are based on the total number of problems for each problem type (shown in the Total n column)

†Temperature: The measurement of body temperature

‡Swab (c+s): Swab sent to an external laboratory for culture and sensitivity testing

§Swab (in-house): Swab examined under microscopy in-house at the veterinary practice

¶Oral examination: Examination of the oral cavity using an otoscope or speculum

**TABLE 2: The 10 most frequently performed in-consultation and post-consultation diagnostic tests across all problems discussed in the three most frequently presented species during direct observation of small animal consultations**

Species	Total n	In-consultation diagnostic tests			Post-consultation diagnostic tests		
		Test	n	%*	Test	n	%*
Dog	2131	Temperature†	176	8.3	Blood test	107	5.0
		Otoscopy	101	4.7	Radiography	28	1.3
		Rectal examination	59	2.8	Urinalysis	23	1.1
		Ophthalmoscopy	53	2.5	Histopathology	17	0.8
		Fluorescein stain	36	1.7	Ultrasound	17	0.8
		Schirmer tear test	19	0.9	Swab (c+s)‡	10	0.5
		Lameness examination	17	0.8	Swab (in-house)§	7	0.3
		Urinalysis	16	0.8	Faecal examination	5	0.2
		Fine needle aspirate	13	0.6	Endoscopy	3	0.1
		Ultrasound	9	0.4	Skin scrapes	2	0.1
Cat	864	Temperature†	103	11.9	Blood test	87	10.1
		Ophthalmoscopy	25	2.9	Urinalysis	20	2.3
		Urinalysis	14	1.6	Radiography	16	1.9
		Fluorescein stain	13	1.5	Ultrasound	8	0.9
		Otoscopy	12	1.4	Blood pressure	3	0.3
		Blood test	5	0.6	Endoscopy	3	0.3
		Rectal examination	4	0.5	Fluid analysis	3	0.3
		Blood pressure	3	0.3	Faecal examination	2	0.2
		Fine needle aspirate	2	0.2	Fine needle aspirate	2	0.2
		Woods lamp	2	0.2	Histopathology	2	0.2
Rabbit	99	Oral examination¶	15	15.2	Radiography	1	1.0
		Temperature†	8	8.1	Swab (c+s)‡	1	1.0
		Neurological exam	1	1.0			
		Otoscopy	1	1.0			
		Ophthalmoscopy	1	1.0			

Only five in-consultation and two post-consultation tests are shown for rabbits as these were the only tests performed in this species

\*Percentages shown are based on the total number of problems for each species (shown in the Total n column)

†Temperature: The measurement of body temperature

‡Swab (c+s): Swab sent to an external laboratory for culture and sensitivity testing

§Swab (in-house): Swab examined under microscopy in-house at the veterinary practice

¶Oral examination: Examination of the oral cavity using an otoscope or speculum

examinations were common in dogs is consistent with previous findings that musculoskeletal conditions are more common in dogs than other species (Hill and others 2006). The lower rate of testing in rabbits, and narrower range of tests performed, could reflect the uncertainty of veterinary practitioners surrounding the diagnostic process in this species. Previous research suggests practitioners feel they have less information available for this species than for dogs and to some extent cats (Nielsen and others 2014).

Limitations of the study include the convenience sample of practices, meaning the results may not be representative of all UK veterinary practices. In addition, only tests that were carried out during or following the consultation, or scheduled for a later date, were recorded. Tests advised by the veterinary surgeon but declined by the client were not recorded. Therefore, factors that could influence the decision to test, such as client preference and cost, could not be taken into account. Despite the limitations, this study provides a useful overview of diagnostic testing which may be useful in guiding veterinary education, ensuring graduates have the skills necessary to carry out and interpret common tests. The results may also be useful for practices, for example, when making decisions regarding in-house training or which diagnostic equipment to invest in. Commonly used diagnostic tests have been identified, and this highlights some potential areas for future research which could be used to aid decision-making in the consultation. For example, the usefulness and interpretation of urinalysis could be investigated with the aim to produce evidence-based guidelines to aid veterinary surgeons when deciding whether to perform urinalysis.

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