Veterinary treatment of wildlife in Australia

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Abstract

A cross-sectional study was undertaken to provide a snapshot of Australian veterinary practices in the treatment of wildlife, and to identify potential risks to animal welfare based on the current situation. An online survey was sent to all veterinary practices across Australia identified through the website Yellow Pages[®]. A total of 132 veterinary practices completed the survey. Results revealed most practices (82%) saw less than 10 wildlife patients per week, with birds and marsupials the most common types of wildlife admitted. Trauma of various kinds made up the majority (82%) of presentations, however wildlife cases were only examined immediately upon presentation in one in five practices. Several barriers to treatment were identified including a lack of time and a lack of wildlife-specific knowledge/skills. The role private veterinary practices play in wildlife treatment and rehabilitation appears to be more significant than previously thought.

Keywords: veterinarians, animal welfare, wildlife

Introduction

Australia's biodiversity is at increasing risk from habitat loss and alteration, disease and predation [1] [2]. These forces appear to be contributing to an increase in wildlife hospital admission rates [3]. Veterinarians specialising in wildlife have been recognised as playing a role in monitoring wildlife diseases [4] [5], educating wildlife rehabilitators [6] and educating the public, [7] however, little is objectively known about the role of private veterinarians in the treatment of wildlife in Australia.

In New South Wales (NSW) alone, 226,474 wild animals were recorded as entering rehabilitation between 2006 and 2011 [8]. Many of these animals would have passed through veterinary practices prior to entering rehabilitation, however the degree to which veterinarians treat wildlife in Australia is currently unknown. A study of United Kingdom (UK) veterinarians found private veterinarians were admitting far higher numbers of wildlife than previously thought, with most of the work performed on a *pro bono* basis [9]. Limitations to the veterinary treatment of wildlife included a lack of wildlife-specific knowledge/skills and wildlife-specific resources/equipment nominated. It is unknown whether this situation is replicated in Australian veterinary practices.

Private veterinarians in Australia have been previously recognised as playing a role in wildlife treatment and rehabilitation [10] [11], however little research has been conducted on this element of wildlife rehabilitation. This research aimed to identify the degree, expense, demands and expectations of private veterinary practice treatment of wildlife in Australia, as well as to identify any potential risks to animal welfare based on the current situation and propose recommendations for improving this situation.

A couple of hypotheses were tested. Firstly, it was presumed that finances would be the biggest barrier to the veterinary treatment of wildlife in Australia, and secondly, it was postulated that wildlife cases would not be examined immediately upon presentation to a

veterinary practice. These hypotheses were developed based on the literature and personal experience.

Materials and Methods

The study involved sending a link to an online survey to veterinary practices across Australia. Due to the nature of the aims, it was important to send the survey directly to veterinary practices rather than individual veterinarians, as staff members other than veterinarians are involved with wildlife handling and treatment and practice activities were being evaluated.

The respondent sourcing method had to be both publicly accessible whilst reducing the likelihood of receiving more than one response from a practice. The sourcing method chosen for veterinary practice email addresses was the publicly accessible business database Yellow Pages[®]. Practice email addresses were found by typing the phrase 'veterinary practice' in the search bar, then practices which listed email addresses in their contact details were included in the study. Search location was determined using a map of Australia, with towns searched in geographical order then crossed off the map once all practice email addresses were collected from that region. Although this method of finding participants was laborious, it allowed a systematic collection process to occur whilst satisfying privacy concerns.

This method of searching for veterinary practice email addresses yielded 1009 addresses from all states and territories of Australia. Of these email addresses, 902 were live, with 107 emails bouncing primarily due to inactive accounts. It is difficult to estimate the percentage of Australian veterinary practices captured by the survey, due to differences in data collection by state and territory veterinary boards (Table 1).

Table 1. Number of veterinarians and veterinary practices in Australia recorded by veterinary boards (November 2016)

State	Veterinarians	Veterinary Practices
Queensland	3100a	unknown
New South Wales	3631	683
Australian Capital Territory	326	46
Tasmania	264	65ª
Victoria	3025°	unknown
South Australia	718	unknown
Western Australia	1426	278
Northern Territory	290 ^b	21
Total	12,780	unknown

^aapproximation from State Veterinary Board; ^bsome veterinary registration lists include 'secondary registrations'; ^cregistrations as of June 2016

The survey consisted of an introductory paragraph which established the aims of the project, followed by 26 questions and a general comments section. The survey questions were developed based on trends observed by analysis of south-east (SE) Queensland wildlife hospitals [3] and the author's personal experiences. As this was a baseline qualitative survey, a large amount of data was collected to satisfy the aims and help test the hypotheses. A copy of the survey can be found in Appendix A.

The survey was first trialled on four veterinarians working in private practice to assess feasibility and clarity before being made live for 1 month from the 16th November 2016 to 14th December 2016. One prompting email was sent to participants a week before the closing date to increase the response rate. Due to survey design, not all respondents answered 100% of questions. Consequently, proportions of each question were readjusted to represent the number of respondents in each calculation. No respondent answered less than 70% of questions, so all respondent answers were included in calculations. Questions which had all 132 respondents answer were not adjusted.

Data collected from the survey was collated in Microsoft Excel 2016 (Microsoft Corporation, Redmond, WA, USA) before being analysed using statistical software SPSS 19.0 (IBM corp, 2010, Version 19.0, Armonk, NY, USA). Statistical analysis of the association between triage policy and time of wildlife assessment was undertaken using Kendall's tau-b correlation. The research protocol was approved by the University of Edinburgh's Human Ethical Review Committee (HERC_31_16).

Results

A total of 132 of the 902 veterinary practices contacted completed the online survey, yielding a response rate of 14.6% (132/902). The age and state distribution of respondents was fairly representative, however there were considerably more female respondents than male. Approximately three-quarters of respondents worked in small animal practice, with the remainder primarily working in mixed practice. Just under one-quarter of respondents were practice owners, with 35% nurses, 37% veterinarians and 4% nominating 'other'. When asked to describe the area their practice was located within, one-quarter of respondents were rural, with 37% suburban, 20% regional and 17% urban.

5.1 Extent of wildlife requiring treatment

Just under half of all veterinary practices saw less than 5 wildlife cases per week, with 37% seeing between 5 to 10 cases per week. The median number of wildlife seen was between 5 and 10 cases per week. Extrapolating this to 52 weeks gives an annual wildlife workload of between 260 and 520 for the practices surveyed. The types of wildlife presenting at each practice were then ranked by respondents from most to least common (Table 2).

Table 2. Ranking of wildlife types presenting to Australian veterinary practices in ascending order from most common (1) to least common (5)

Wildlife type	Rank				
	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
Birds	113 (86)	7 (5)	1 (1)	1 (1)	10 (7)
Marsupials	7 (5)	72 (55)	22 (17)	24 (18)	7 (5)
Reptiles	1 (1)	33 (25)	73 (55)	25 (19)	0 (0)
Amphibians	9 (7)	6 (4)	3 (2)	42 (32)	72 (55)
Non-natives	2 (1)	14 (11)	33 (25)	40 (30)	43 (33)

When asked what the most common presentation for wildlife was at their practice, over half indicated vehicular trauma, with 22% reporting trauma (other), 13% reporting

neonatal/orphaned, 9% nominating animal predation, 3% indicated disease and 2% reported other/unknown as the most common presentation. Respondents were also asked what the most common outcome was for wildlife presenting to their practice, with a third reporting most wildlife were euthanased, however over a half indicated rehabilitation via a wildlife carer was the most common outcome for wildlife. Less common outcomes included referral to a wildlife hospital, treatment either medical and/or surgical and immediate release.

Most respondents felt as though wildlife work at their veterinary practice had increased over the past 10 years, and of these, 37% felt as though wildlife work had increased very much or extremely.

5.2 Ability of practices to service wildlife

Evaluation of the resources available for wildlife treatment at practices showed 86% had both wildlife specific diets (e.g. Wombaroo® formulations) and feeding aids available. Availability of external heating sources (e.g. heat lamps) and wildlife specific housing (e.g. marsupial pouches) were less common, with 60% and 63% of respondents respectively indicating these resources were available at their practices. Almost three-quarters of respondents indicated wildlife were seen by a veterinarian whenever they had spare time, as opposed to the 20% who believed wildlife were seen immediately upon presentation. A small number indicated wildlife were seen either after morning consults or during breaks. Respondents were evenly split between those practices which did have a specific wildlife triage and treatment policy and those that did not.

There was no significant relationship between those practices which did have a specific wildlife triage policy and when wildlife was seen by a veterinarian. When asked how often they administered analgesics to wildlife at their practice, just under half specified they sometimes gave analgesics, with a third stating they very often administered analgesics to wildlife. Accessibility to wildlife carers was evaluated by asking respondents whether they found it problematic to locate wildlife carers in a timely manner. 40% of respondents felt it was not really an issue, with a further 17% believing it was not a problem at all. Barriers to the treatment of wildlife were queried, with about one-quarter believing that either time or knowledge and skills were the biggest barriers to treatment. The remaining respondents felt that finances or a lack of wildlife specific resources were the biggest limitations. 16% of respondents didn't believe there were any barriers to treating wildlife in their practice.

5.3 Financial implications of wildlife treatment

The vast majority of respondents indicated they either never or rarely received reimbursement for any of the wildlife treatment undertaken by the practice. Of the small percentage of practices which did receive reimbursement for wildlife treatment, the majority were paid less than 10% of their total wildlife treatment costs. Veterinary practices which received reimbursement for some of their wildlife treatment were asked for the primary source of the funding. Over half had wildlife treatment reimbursed by members of the public, with over one-quarter receiving funds from wildlife rehabilitation groups. No practice indicated they received government reimbursement for the treatment of wildlife, although we do know that

Wildlife Health Australia provides some funding to clinics around the country as part of their 'Sentinel Clinic Wildlife Disease Surveillance Program'.

When asked to estimate how much money the practice spent on wildlife treatment annually, responses were skewed, with one third indicating that their practice spent over \$1000 annually and half spending between \$100 and \$800 annually. Taking the median value for each expense range and applying this to the number of respondents in each range, gives a total annual wildlife expenditure of approximately \$111,100 by private veterinary practices surveyed in this study.

5.4 Interest in further wildlife education

Respondents were generally open to learning more about wildlife treatment, with just under half stating they were definitely interested in learning more. Table 3 shows the preferred methods for accessing wildlife information.

Table 3. Preferred information sources of Australian veterinary practices to aid learning about wildlife treatment

Source	Frequency	Proportion (%)
Online module	75/129	58
Fact-sheet	66/129	51
Standard protocols	62/129	48
Textbook	41/129	32
Seminar	38/129	29
Undergraduate education	11/129	9

Discussion

This study aimed to establish baseline data on veterinary practices treating wildlife in Australia by identifying the degree, expense, demands and expectations of veterinary practices as well as identifying any potential risks to animal welfare based on the current situation. In doing so, it sought to explore two hypotheses, firstly, that finances would be the biggest limitation to veterinarians treating wildlife, and secondly, that wildlife would not be examined immediately upon presentation.

Although finances were a barrier to some veterinary practices treating wildlife, other more important constraints were found to be a lack of wildlife-specific knowledge/skills and a lack of time. The survey results strongly supported the second hypothesis, as wildlife were only examined immediately upon presentation in one fifth of veterinary practices, with most indicating wildlife were seen whenever veterinarians had a spare moment. This finding reinforces the perception that time was a major barrier to veterinary practices treating wildlife.

The number of wildlife cases received by practices was heavily skewed towards the lower end of the data set, with 82% of respondents seeing less than 10 wildlife cases per week, and the estimated median of the grouped data being 5 to 10 cases per week. This would give an annual workload of approximately 260 and 520 wildlife cases per veterinary practice, which

if extrapolated to a state like NSW with 683 veterinary practices registered in 2016, suggests an annual wildlife caseload of between 177,580 and 355,160 patients. This is comparable to the 226,474 wild animals which were brought into rehabilitation with wildlife carers in NSW over a 6-year period from July 2005 to June 2011 [8]. Thus, the estimated number of wildlife admitted to private veterinary practices annually in NSW considerably higher than the number entering rehabilitation.

With over half of respondents indicating the most common outcome for wildlife was rehabilitation with a wildlife carer, this suggests between 95,893 and 191,786 wildlife patients admitted to NSW veterinary practices could then go on to rehabilitation with wildlife carers. However, analysis of official records from wildlife carers estimate only 55,000 wildlife patients enter rehabilitation in NSW annually [8]. The difference in the estimated figures entering rehabilitation is possibly because the 'most likely outcome' for wildlife fails to consider alternative outcomes for those veterinary practices including euthanasia. Currently, there is no requirement for veterinary practices to report or record the number of wildlife entering their facilities.

The types of wildlife entering veterinary practices was similar to those found in previous studies of wildlife hospital admissions in SE Queensland [12] and wildlife rehabilitation records in NSW [8]. Birds were the most commonly admitted animal followed by marsupials, reptiles, non-native animals and amphibians.

Trauma of various types made up the majority (82%) of presentations to veterinary practices, when the categories of vehicular trauma, trauma (other) and animal predation were combined. Again, this mirrors data from the UK [9] and SE Queensland [12]. Wildlife will generally avoid human contact if possible, therefore for a wild animal to be captured by the public and restrained long enough to be brought into a veterinary practice, it will likely be quite moribund [13].

A traumatic injury can be any injury which "is caused by a sudden violent force that results in a compression, stretching, torsion, or penetration of the tissues" [14]. Any degree of trauma is considered painful, although wild animals often hide signs of pain even in severe traumatic injuries [15]. Thus, from a pain management perspective, these patients should be examined and treated as soon as possible upon presentation. However, only 1 in 5 veterinary practices regularly saw wildlife immediately upon presentation to the practice. Three-quarters of respondents saw wildlife 'whenever they had spare time', with the implication that many animals with potentially severe injuries were not receiving prompt attention.

Administration of analgesics varied, with just under half of all respondents indicating they sometimes gave analgesics. Only one question queried analgesic use and more research needs to be conducted to determine the type of analgesics, administration method and clinical decisions which result in analgesic administration.

The amount of wildlife work was reported to be steadily increasing, with four out of five respondents indicating their wildlife workload had increased over the past decade. This matches data from the UK [9] and SE Queensland [12] which highlights the increasing wildlife workload of both veterinary practices and wildlife hospitals. The reasons behind this

increase are likely multifactorial; with further research required to determine the impacts that urbanisation, increasing public awareness and habitat loss are playing.

The biggest, self-identified barriers to private veterinary practices treating wildlife were a lack of wildlife-specific knowledge/skills and time. This differed somewhat from a study on UK veterinarians [9], which identified wildlife-specific knowledge/skills and wildlife-specific facilities/equipment as the biggest restrictions to the veterinary treatment of wildlife. However, both studies have shown that a perceived lack of knowledge and skills is a major restriction to private veterinary practices treating wildlife and investing in resources to overcome this barrier might be beneficial. Respondents were generally interested in learning more about wildlife treatment and rehabilitation, with just under 70% of respondents answering positively to a question gauging their interest in further education. With a lack of knowledge/skills identified as one of the biggest barriers to veterinary practices treating wildlife, receptivity to further education provides an avenue for the development of educational resources. An online module or fact sheet were nominated by more than half of respondents as their preferred method of learning about wildlife treatment.

Although finances were not identified as a major barrier to respondents treating wildlife, this study revealed veterinarians overwhelmingly conduct wildlife work on a *pro bono* basis. Thus, financial costs incurred might present a barrier to delivery of veterinary treatment of wildlife indirectly, through a lack of urgency to see cases, a reduced inclination to perform thorough physical examinations or diagnostics, and a lower incentive to seek further education. More research needs to be conducted to determine the role of finances in wildlife treatment and welfare. There was no significant relationship between practices which had a specific wildlife triage policy and when wildlife was seen by a veterinarian, suggesting triage policies were either not followed by staff or failed to make wildlife cases a priority.

Securing the welfare of wildlife admitted to private veterinary practices requires prompt assessment and treatment of patients, and this might be facilitated by having effective triage policies and wildlife specific information readily available for staff members.

Study limitations

The paucity of data on veterinary practices across Australia as seen in Table 1, makes it difficult to determine the representativeness of the sample size of 132 practices, however it is likely to represent only a small portion of veterinary practices in Australia. Using the openly accessible Yellow Pages® to source practice email addresses satisfied privacy concerns and provided a convenient sample of practices, however it relied on practices to firstly list their data online, and to secondly include a current email address in their profile. There was also the potential for non-response bias, where those practices with differing viewpoints or little interest in wildlife did not respond. The survey design failed to exclude the possibility of repeated responses from the same practice, as the email with the survey link could have been accessed by multiple personnel. As this is a cross-sectional survey, any associations determined by this study are unlikely to be a true cause and effect relationship.

Significantly more female than male staff responded to this survey, with the female response bias of online surveys well recognised in the literature. However, the roles of veterinarian and

veterinary nurse have become increasingly feminised over the past decade with more females than males now working in private veterinary practices [17], and so it is possible this bias is reflective of the current workforce demographics.

The position of a respondent within the practice is likely to have impacted some of their responses, due to differing knowledge of practice protocols. As with any baseline study, there is a failure to capture nuance in a population and a potential for misdirection in questioning.

Conclusions

This study highlighted the important role private veterinarians play in wildlife rehabilitation and determined a much higher caseload than previously thought. The results demonstrated the *pro bono* nature of veterinary treatment of wildlife, as well as some of the barriers to treatment and willingness of veterinary practices to learn more about wildlife medicine. There is a role here for state environment departments and wildlife groups to recognise the contribution of private veterinary practices in the treatment and care of wildlife, and to engage with them to determine how collaborative processes could encourage better wildlife outcomes.

Given the identified impacts of time and knowledge/skills on veterinarians treating wildlife, there is the need to further investigate these barriers to allow the development of practical solutions to overcome these limitations. There are significant animal welfare risks associated with current practices which deserve further research. Educational resources which aid veterinary assessment of wildlife should also be explored.

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Appendix A - copy of survey

The purpose of this survey is to determine the current state of the treatment of wildlife in veterinary practices across Australia. The survey is being conducted by Bronwyn Orr BVSc, a Masters candidate with the University of Edinburgh. The information collected in this survey will be anonymous and used to establish baseline data on the degree, expense, demands and expectations of veterinary treatment of wildlife. It should take about 15 minutes to complete the survey. Your participation in this study is voluntary and you can withdraw from filling in the survey at any time by closing the window. Completion and submission of the survey will be taken as your consent to use the data you provide as described above.

Thank you for participating.

1	What is your position within the practice?	Veterinarian Nurse Practice owner Receptionist Other
2	What gender do you identify with?	Male Female Other
3	How many vets (full time equivalent) work at your practice?	
4	How many nurses (full time equivalent) work at your practice?	
5	What age bracket do you fall into?	18-24 25-34 35-44 45-54 55-64 65 or older
6	What is the primary focus of your practice?	Small Mixed

		Equine
		Exotic
		Specialist
		Other
7	How would you describe the area where your practice is	Urban
-	located?	Suburban
	iooatou:	Regional
		Rural
8	In which state or territory does your practice reside?	New South Wales
		Queensland
		Northern Territory
		Western Australia
		South Australia
		Victoria
		Australian Capital Territory
		Tasmania
_	AMILIO CONTROL	
9	What is the average number of wildlife cases seen at your	<5
	practice in a typical week?	5-10
		10-15
		15-20
		20+
10	What are the most common types of wildlife seen at your	Birds
10	clinic? Please rank from most common (1) to least common	Marsupials
	(5).	Reptiles
		Amphibians
		Non-natives
11	Do you have any of the following specialised resources for	-Wildlife specific diets e.g. Wombaroo
	wildlife at your practice? (select any that apply)	formulations, meal worms
		-External heating sources e.g. Heat
		lamps, incubators
		-Feeding aids e.g. Crop needles, teats
		-Wildlife specific housing e.g. Hides,
		perches, marsupial pouches
12	Generally, when are wildlife cases seen by a veterinarian at	-Immediately upon presentation
	your practice?	-After morning consults
		-After all surgeries
		-During breaks
		-Whenever we have a spare moment
13	Do you receive reimbursement for any of the wildlife treatment	Never
'3	undertaken by the practice?	Rarely
	undertaken by the practice!	
		Every once in a while
		Sometimes
		Almost always
14	If you receive reimbursement, approximately what percentage	<10%
	of total wildlife treatment is reimbursed?	10-30%
		30-50%
		40-70%
4-	When in the maintain and a second of colors and a second of the second o	>70%
15	Who is the primary source of reimbursement for wildlife	Members of the public
	treatment?	Wildlife rehabilitation groups
		Government
		Welfare Societies
		Other
16	How much money do you estimate the practice spends on	<\$100
10		
	treating wildlife annually?	\$100-300
		\$300-500
		\$500-800
		\$800-1000
		>\$1000
	ı	,

17	What is the most common presentation for wildlife at your practice?	Vehicular trauma Animal predation Trauma (other) Disease Neonatal / orphaned Other / unknown
18	Does the practice have a specific wildlife triage and treatment policy?	Yes No
19	What is the most common outcome of wildlife presented to the practice?	Rehabilitation via a wildlife carer Immediate release Euthanasia Treatment (medial and/or surgical) Referral to a wildlife hospital
20	How often do you administer analgesics to wildlife presenting at your practice?	Always Very often Sometimes Almost never Never
21	Is it a problem at your practice to find wildlife carers to rehabilitate wildlife in a timely manner?	Not at all Not really Undecided Somewhat Very much
22	In your opinion, what is the biggest barrier to the treatment of wildlife in your practice?	Time Finances Knowledge and skills Lack of wildlife specific resources No barrier
23	How interested would you be in learning more about wildlife and its treatment?	Definitely Maybe Neutral Maybe not Definitely not
24	How would you prefer to access information about treating wildlife? (select any that apply)	Online module Seminar Fact-sheet Standard protocols Textbook Undergraduate education
25	Do you feel as though the wildlife work at your practice has increased over the past 10 years?	Not at all Slightly Moderately Very Extremely
26	Do you think that private vets currently see too much wildlife work?	Strongly agree Agree Neutral Disagree Strongly disagree
27	Additional comments (feel free to add any further comments in this section)	