Making good use of statistics

Statistics are just a tool to help you answer the questions you have set. It may sound obvious, but the clearer the questions you set, the easier it is to answer them says Darren Shaw, who offers some advice on the use of statistics in practice research projects.

The vast majority of my conversations with veterinary colleagues about the design and analysis of their research projects are about focusing in on what exactly the questions are.

In the case of a project, the questions are normally framed in terms of the hypotheses you are testing. You need to ensure that your hypothesis is as clear and precise as possible. The more vague your hypothesis is at the start, the harder it will be to answer it in any meaningful way. For example, you need to be more precise than just, say, ‘Is there a difference in growth between male and female cats?’ You need to think about over what time period, what breeds, what part of the body is being measured, whether you need to control for diet/environment, etc. The more that you define exactly what you want to know – for example, ‘Is there a difference in growth as measured by the change in weight in the first two months of life between male and female non-pedigree kittens not weaned’ – the easier it is to set up the project, measure the correct things, analyse and present the results, interpret any results and, importantly, not to over-extrapolate.

With respect to the actual statistics, a useful way to think about what statistics might be required is to use a framework to guide you. This will help you to decide how to summarise your data as well as from a statistical point of view. In addition, it will hopefully mean that if you do consult statistics books or other people, you have some idea of where you could be looking or what you should be asking. Otherwise you are faced with working through all the myriad different statistical procedures and tests out there trying to see which might be the one for the question you are trying to answer.

A number of possible frameworks can be used. The one that I use is to ask a series of questions about my data:

(1) How many groups will I have?
One (e.g., one group of labrador retrievers); two (e.g., male and female Siamese cats); more than two (e.g., three different antibiotic treatment groups)?

(2) How many ‘things’ am I measuring?
One (e.g., length of tail of puppies at six months old); two (e.g., insulin levels and weight in 10-year-old cats)?

(3) How often have I measured these things?
Once (e.g., albumin levels at weaning); twice (e.g., white blood cell counts pre- and three days post-treatment [i.e., a paired sample where the same individuals are measured twice]); more than twice (e.g., percentage of dermatitis in dogs measured once a fortnight for eight weeks)?

(4) Are my data:
Numerical (e.g., tick burdens, length of the left forelimb) and within that are they (a) continuous/parametric (e.g., creatinine levels) or (b) ranked/non-parametric (e.g., body condition score, pathology index); or are my data categorical (e.g., cat underwent surgery or chemotherapy) and within that are they (a) binary (e.g., disease present/absent) or (b) more than two groups (e.g., hair colour, breeds)?

Once I have answers to these four questions I can then select the appropriate statistical test based on the number of groups.

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and the frequency, type and number of different data I am measuring. Most statistical help pages/books will describe statistical tests in relation to these four questions.

**Where to go for advice**
A number of programmes are being run between some of the UK veterinary schools (Liverpool, Cambridge and Nottingham’s Centre for Evidence-based Veterinary Medicine) and veterinary practices to encourage research in practice. In addition, a new initiative has been put together in consultation with BSAVA Petsavers where individuals at all of the UK veterinary schools have offered to help with queries about the design and proposed analysis of Petsavers projects prior to submission. E-mail inquiries can be sent to grantsstudyadvice@bsava.com and queries will be forwarded to the appropriate vet school.

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**Writing a grant proposal**

*Natasha Mitchell, who recently completed a Petsavers-funded research project from practice, offers some advice on writing a grant proposal*

When applying for a grant, it is of utmost importance to fulfil the requirements that are laid out in the terms and conditions.

In the case of Petsavers, which funded my own project (on ocular findings in cats with diabetes mellitus), the study must not involve any experimental procedures, including procedures that could be construed as experimental, or data from experimental studies. All required interventions must be considered appropriate for normal good clinical practice; in other words it must potentially benefit the animals being studied. For example, taking a blood sample from a normal but older cat is considered acceptable as it is acknowledged that it is an advantage to an older cat to have geriatric blood tests carried out. However, taking a skin biopsy from the same normal cat would not be considered acceptable. Clear advice is included in the RCVS Guide to Professional Conduct.

**Study design**
The title of the project is essentially the question that will be answered by the research. It should be short, clear and relevant. The clearer the question, the easier it is to obtain the answer. Also, the more work that goes into the study design in the proposal, the easier it will be to carry out the project if the application is successful. Application forms need to be filled out carefully, as the conditions must be adhered to or the grant will not be awarded.

In the case of Petsavers grants, the application form can be downloaded from www.petsavers.org.uk. Information required for the application includes a current CV, the project title and intended duration, aims, background, experimental design, how the results will be analysed and how they should be of benefit to pets. Three reviewers will be asked to consider your application. These are vets with clinical skills and knowledge within the subject area, and they may be able to provide positive feedback as to how you might best achieve your goal.

**Estimating costs**
An analysis of expected costs and expenditure needs to be provided, noting that Petsavers does not provide direct funding for salaries, travel or continued professional development.

Separate travel scholarships are available, which you could also apply for, and these are offered by the RCVS Charitable Trust, the British Equine Veterinary Association Trust and various veterinary specialty associations.

From the outset, the project costs such as consumables and laboratory fees need to be estimated. There are a few measures that can be taken to keep costs down. It is worthwhile contacting laboratories to get a quote for the work that is required, as they may give a discount for bulk samples. Also consider what equipment you need and whether you might be able to borrow essential pieces. While Petsavers may consider helping with the purchase of essential equipment, this will remain the charity’s property when the project is completed.

It is a good idea to be aware of other research projects that are being carried out in related areas, as they may be trying to recruit samples and have the funds to provide you with results, which would reduce your own costs.

The proposed project should be feasible, interesting, ethical and relevant. The applicant must show that the study is likely to advance the understanding and management of disease in small animals; that the work may be carried out effectively in the time given and with the facilities available; that they are competent to carry out the proposed work with realistic costs, and, most importantly, that the project is ethical both under UK law and within the Petsavers conditions.

The successful applicant is required to sign a contract with Petsavers, agreeing to the terms and conditions and formalising the commitment before the funds can be awarded. Of course, some pay-back is required: a lay summary of the project is required for publication in the BSAVA’s magazine, companion; an annual progress report has to be submitted until completion of the project; publication of at least one scientific paper in peer-reviewed literature is expected; the support of Petsavers must be acknowledged in written publications and oral presentations arising from the project.

**What the committee considers**
In considering a proposal, the Petsavers committee considers:

- The welfare, wellbeing and safety of the animals being studied;
- The scientific merit of the project;
- The extent to which the project is likely to increase knowledge and benefit pets;
- The ability of the veterinary surgeon to carry out the research;
- Whether the costings are realistic and acceptable;
- The likelihood of the project being completed in the timeframe proposed.

The available Petsavers grants range from £1000 to £8000. The Petsavers committee is very helpful and committee members are available for advice and feedback, and will guide applicants seeking assistance as best they can. The deadline for applications is published on the website, and applications cannot be accepted after this date. The next deadline for applications is August 31, and the awards will be made to the successful applicants in March 2012.
Writing a grant proposal

Natasha Mitchell

Veterinary Record 2011 169: ii
doi: 10.1136/vr.g7150

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