# RCVS KNOWLEDGE

# EBVM Learning



## Course summary

This course introduces the concepts of **Evidence-based Veterinary Medicine (EBVM)**, and aims to give you a foundation from which you can start to apply EBVM to your own veterinary work.

After a general introduction to the principles of EBVM, each section explains one of the five main principles of the methodology. These sections include detailed examples, opportunities for you to reflect on what you've learned, and quizzes for you to check your understanding. Each section will take approximately an hour to complete in full.

## Summary of sections

| | | |
|---|---|---|
| ➕ **ABCs of EBVM** | | Click to expand |
| ➕ **Ask** | | Click to expand |
| ➕ **Acquire** | | Click to expand |
| ➕ **Appraise** | | Click to expand |
| ➕ **Apply** | | Click to expand |
| ➕ **Assess** | | Click to expand |
| ➕ **What next?** | | Click to expand |

### Course features

🖸 **Cost**
Free

🕐 **CPD hours**
1 per module

▤ **Modules**
6

☑ **Who is this course for?**
- Veterinary surgeons
- Veterinary nurses
- Veterinary students
- Veterinary educators

### Feedback

❝ The material covered in the course matched my expectations and more, and there were great case examples to back up the points raised."

*Holly Warrilow RVN*

### Help

Help using this course ➜

## Start the course ➜

# ABCs of EBVM

# Table of contents

# 1. Introduction



**A new way to think**
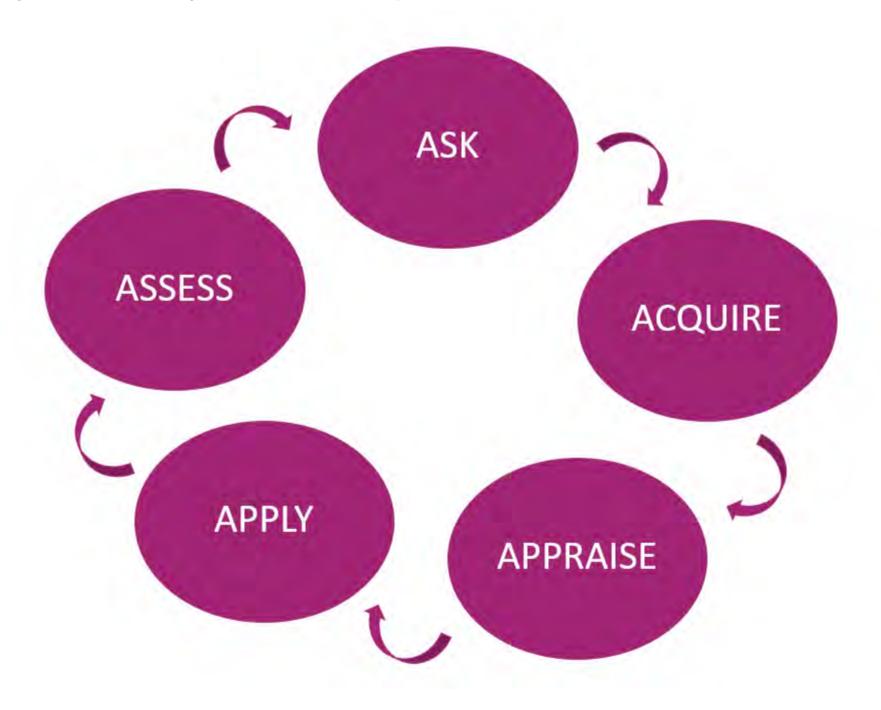
By the end of this section you will be able to:

- explain the concept of EBVM

- construct a generalised example of the EBVM cycle

- describe the relevance, importance and challenges of EBVM to veterinary practice.

## 2. What is EBVM?

> **At its core, evidence-based veterinary medicine (EBVM) is a structured and explicit method that helps us make decisions, in clinical practice as well as other areas where veterinarians might work.**

EBVM has been explained as five main steps which form a cycle. The cycle takes its principles from human evidence-based medicine (Heneghan and Badenhoch, 2006) and has been used to produce this course.

## Figure 1: EVBM Cycle - The Five Steps



## As you progress through this course you will learn about each of the five steps in more detail:
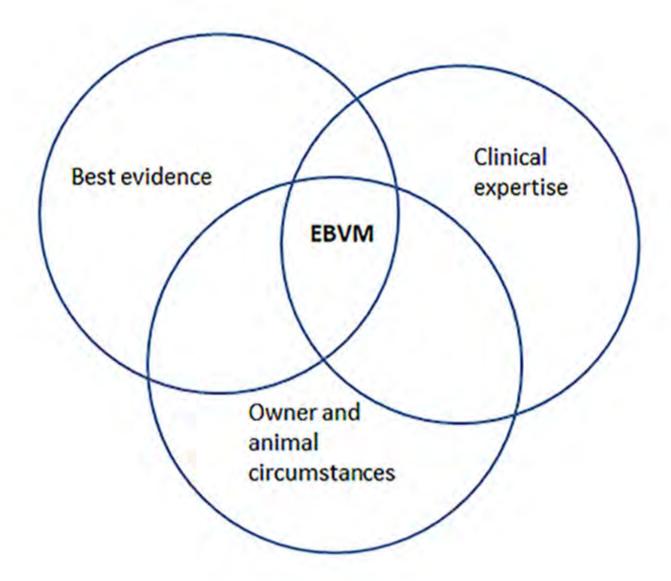
- **Ask** – defining an answerable clinical question that is of interest

- **Acquire** – finding out if evidence exists to answer the question and acquiring that evidence

- **Appraise** – assessing the quality of the relevant evidence found

- **Apply** – implementing the evidence into clinical practice where appropriate

- **Assess** – evaluating the impact of the implementation and changes in clinical practice

Where evidence **does** exist to answer our clinical question, we move through the stages of the EBVM cycle, enabling us to construct our own evidence-based decisions. This process incorporates more than just finding the "best" available evidence:

> Evidence-based veterinary medicine is the use of the best relevant evidence in conjunction with clinical expertise to make the best possible decision about a veterinary patient. The circumstances of each patient, and the circumstances and values of the owner/carer, must also be considered when making an evidence-based decision (Centre for Evidence-Based Veterinary Medicine, CEVM ↗).

## Figure 2: Decision-making in EBVM



Where evidence **does not** exist for our clinical question, we identify gaps in the evidence base. This is referred to as 'zero evidence' and will be explored in more detail throughout the course.

Many of the terms used in defining EBVM are included for a specific reason but may also raise questions. For instance:

- What is meant by 'best' available evidence?
- How do we balance our patient's circumstances with our owner's circumstances?
- What importance do we place on our own clinical expertise as compared to what is available in the literature?
- How do we deal with 'zero evidence'?

We will seek to answer these questions as we proceed through this course – and perhaps come up with a few more!

In this introductory section, we will discover the history of evidence-based medicine (EBM) and the subsequent development of EBVM. We will guide you on your EBVM journey, exploring the clinical applications of EBVM and how to address the challenges you may face.

# 3. History of EBVM

> ### 🔖 A tale of old – How Dr James Lind cured scurvy

In the 18th century, sailors died from scurvy on a regular basis. In 1747, on Her Majesty's Ship the Salisbury, young men under the care of Dr James Lind were dying, despite him following the current treatment recommendations for scurvy. At the time, the Royal College of Physicians recommended sulphuric acid, and the Admiralty recommended vinegar treatments. Dr Lind noted that the recommendations were all written by 'experts' who had never been on a long sea voyage.



Dr Lind reviewed the current evidence and ran his own treatment trial to see if he could find a treatment for scurvy. His trial compared the success of a concoction of sulphuric acid, vinegar, nutmeg, cider and seawater to a diet of two oranges and one lemon in different groups of sailors in similar stages of disease, who were otherwise sharing the same basic diet.

The sailors receiving the citrus fruit clearly improved more quickly than those ingesting the tasty sulphuric acid concoction, and Dr Lind had some evidence for a superior treatment. Following this clinical trial, the Admiralty made lemon juice compulsory for sailors, and deaths due to scurvy declined precipitously.

Dr Lind's study is an excellent early example of the practice of EBM. As a clinician, Dr Lind posed the right, pertinent question about the disease, reviewed the relevant current evidence (literature), recognised the limitations of that evidence, and then executed a simple clinical trial, which led to a change in the way he treated his patients. Dr Lind also passed on his new knowledge by telling the Admiralty and the Royal College of Physicians, who then instituted change, saving many lives at sea.

Over the last few decades, EBM has significantly impacted and, in many areas, improved patient care. There are now many human healthcare initiatives in place to assist evidence-based decision-making:

- [Cochrane Collaboration](#) 🔗
- [The Centre for Evidence-Based Medicine (CEBM)](#) 🔗
- [Centre for Evidence-Based Dentistry (CEBD)](#) 🔗

Challenges remain, highlighted by the *British Medical Journal*'s publication of the EBM manifesto describing the steps required to develop more trustworthy evidence (Heneghan et al., 2017)

# 4. The development of EBVM

In this section, we will look at similarities and differences between evidence-based medicine and evidence-based veterinary medicine, and some examples of key evidence-based veterinary medicine initiatives.

# 4.1 How does EBVM compare to EBM?

**EBVM has drawn upon expertise in the medical field, where applying the principles in practice has become widely accepted. For example, in the UK the [NICE guidelines](#) ⬈ provide human healthcare professionals with guidance and advice on the evidence across broad health and social care topics.**

Human healthcare professionals' and veterinarians' practices are in many ways similar, but significant differences between EBM and EBVM exist, including:

- patient–(owner)–clinician relationship
- availability and quality of scientific literature
- funding and insurance models
- expectations of end-of-life care.

These differences affect how we approach evidence-based practice in the veterinary context and will be explored throughout the course.

A question to ponder:

**How often do I use evidence to aid my own clinical decision-making in veterinary practice?**

# 4.2 EBVM initiatives

> **The principles of EBM are now commonplace in human healthcare, but how has using an evidence base been approached in veterinary practice?**

Awareness and use of EBVM is constantly increasing, with the fundamentals of EBVM being taught to undergraduates in vet schools internationally with growing support from key professional bodies such as the British Veterinary Association ⤤ (BVA) and the American Veterinary Medical Association ⤤ (AVMA). The quantity of evidence is likely to grow in each of the various specialist areas of the profession.

There are a number of groups taking the lead on EBVM internationally. Find out more about these below.

---

**✖ Evidence-based Veterinary Medicine Association**                     Click to close

The **Evidence-based Veterinary Medicine Association** ⤤ (EBVMA) in North America was founded in 2004 to improve the co-ordination and communication between individuals promoting research, teaching, and clinical application of EBVM to practice (Slater, 2010).

---

**✖ Centre for Evidence-based Veterinary Medicine**                     Click to close

In 2009, the **Centre for Evidence-based Veterinary Medicine** ⤤ (CEVM) at the University of Nottingham in the United Kingdom was established. This centre has brought and adapted a number of EBM methodologies to the veterinary profession and covers four main areas of research: evidence synthesis, population research, practice-based research and education and information exchange.

---

**✖ RCVS Knowledge**                     Click to close

**RCVS Knowledge** ⤤ is a UK charity with a mission to advance the quality of veterinary care for the benefit of animals, the public, and society. RCVS Knowledge has championed the use of an evidence-based approach to veterinary medicine since 2014, and provides free tools, resources and education to the veterinary professions.

The charity's resources include *Veterinary Evidence* ⤤, a free, open access, peer-reviewed journal that publishes evidence based on questions from veterinary professionals; *inFOCUS* ⤤, a journal watch providing summaries of the latest research with the potential to impact care from over 100 journals; a **Library and Information Services** ⤤; and a growing suite of **quality improvement tools and learning resources** ⤤.

---

Other recent initiatives include:

- *Evidence-Based Veterinary Medicine Matters* ⤤, a publication from RCVS Knowledge and Sense About Science supported by 14 UK organisations, including vet schools and policy-making bodies, outlining a commitment to the future of EBVM. The publication makes a strong case for much-needed funding for research to grow the evidence base.
- An **CIVME EBVM Toolbox** ⤤ created by a Council on International Veterinary Medical Education project (2019), which provides information for educators who are reviewing or introducing research and/or evidence-based veterinary medicine (EBVM) in a curriculum.

# 5. Why is EBVM important?

In this section, we look at the benefits of EBVM in different clinical scenarios and in handling information overload. We also discuss how EBVM can be incorporated into Quality Improvement.

# 5.1 Clinical applications of EBVM

**EBVM can help practitioners in a number of ways.**

**The ways EBVM can help practitioners include:**

- improving confidence in your own clinical decision-making
- dealing with information overload
- developing a structured approach to using reliable evidence-based methods in your practice, for example, practice guidelines
- demonstrating Quality Improvement in practice, which might include the use of EBVM to carry out a clinical audit.

**Clinical examples could arise by considering the following:**

- a recent journal article that recommends a different diagnostic method or treatment protocol from that which you currently use
- a particularly challenging or unresolved case
- evaluating a new marketing leaflet you have received from a pharmaceutical company
- a need for new practice protocols or guidelines, or to review existing ones
- questions arising from case discussions within the practice
- an area in which you know you would like to develop your skills
- a disease you and your colleagues approach differently in terms of diagnostics or therapy
- a disease process you treat that you feel has unsatisfactory outcomes
- a case report or publication you are keen to work on
- clinical audit activity.

# 5.2 Information overload

Over recent decades, there have been massive increases in the availability of information, both in the medical and veterinary literature, but also in mainstream media.

For instance, there were 87,000 veterinary papers published in one year (CAB Abstracts 2018) which would equate to reading 238 papers per day – it is not possible to read all the primary literature, or to subscribe to all the relevant journals.

Various strategies for finding and disseminating information have been developed to address this information overload. The availability of evidence summaries (Acquire 3.2) that provide a 'clinical bottom line' is increasing in the veterinary field.

Evidence summaries are produced by asking a clinical question, acquiring and appraising the available evidence and producing a summary of 'best' available evidence, often referred to as a 'clinical bottom line'. Online collections of evidence summaries are freely available through BestBETs for Vets ⬏ and RCVS Knowledge's Knowledge Summaries ⬏.

RCVS Knowledge's *inFocus* ⬏ serves busy practitioners: a simple 'research news' update providing concise summaries of important and interesting practice-critical material. Practitioners can access these online or subscribe to a bi-monthly email.

While there is a wealth of information available on the internet, it is important to recognise that the quality, source, and reliability of this information varies, from the evidence summaries mentioned above, to online public discussion forums.

Not all information on the internet is unreliable. Despite the increase in the amount of available literature, there is still scant **relevant** evidence for many common veterinary conditions, meaning other sources of information need to be considered and appraised. Using the internet for searching evidence will be covered in more detail in the Acquire section.

# 5.3 How does EBVM apply to Quality Improvement?

**Quality Improvement is a systematic approach to reviewing the quality of our practice in order to make changes to ensure continuous improvement. It encompasses a variety of specific techniques and tools, including clinical audit, benchmarking, significant event audit and the creation and implementation of guidelines and checklists.**

You might be involved in carrying out a clinical audit in your practice as part of a practice accreditation scheme, such as the RCVS Practice Standards Scheme ⧉. More and more practices are signing up to practice accreditation schemes, which provide quality assurance for consumers. The principles of using EBVM in carrying out clinical audit are covered in the Assess section.

Many veterinary practices are following the human healthcare approach and developing their own practice protocols and guidelines for the diagnosis and treatment of common conditions. In some cases, these protocols and guidelines will, by necessity, be based on the clinical experience of the practitioners, as this may be the only form of evidence available.

However, as EBVM is incorporated into veterinary practice and more quality scientific evidence becomes available, it is reasonable to expect that such guidelines will incorporate reliable evidence and be developed using the principles of EBVM. This will be covered in the Apply section.

The benefits of using these EBVM principles for Quality Improvement may include greater client and staff satisfaction, better patient outcomes and assist practice management decisions around future business development.

Find out more about Quality Improvement in the veterinary professions ⧉.

# 6. Challenges of EBVM

There are several challenges to EBVM that can be encountered in practice, but by acknowledging these and working together to generate and utilise evidence, integrating EBVM into our daily practice can and will become easier.

# 6.1 What are the challenges?

### ⏰ Time

One of the first considerations is the time it takes to engage in each of the five stages of the EBVM cycle. As busy veterinary practitioners, it can be challenging to find the time in a daily work schedule that includes consults, surgeries, emergencies, etc. Existing evidence syntheses (e.g. Knowledge Summaries) are a helpful place to start your EBVM journey.

### 🗞 Access to journal articles and databases

Even when there is evidence available, frustratingly, it can be difficult to access; journals often require a subscription fee to access research papers. Veterinarians working outside of academic institutions may only have access to a handful of journals through their practice or personal subscriptions and may not have access to databases limiting their ability to acquire evidence.

There are more 'free access' resources available, although the quality of the evidence can vary. One initiative, the [RCVS Knowledge Library and Information Services ↗](), has seen increasing numbers of practitioners subscribing to its service, which provides access to a range of full-text electronic journals for an annual fee.

### 👥 Client access to 'evidence'

Clients have access to many of the same resources that veterinary professionals do, but usually lack the clinical expertise to assess whether the advice they find online is sensible. They may have attempted diagnosis, and treatment, before seeking veterinary advice, and the veterinary surgeon now has an important role in educating owners.

### ❓ A dearth of evidence

Experts agree that there is a lack of high-quality published evidence for veterinary medicine (Dean and Brennan, 2016; Lanyon, 2014), especially in comparison with the larger evidence-base for human medicine and that funding is an issue:

> ❝ case-based research in the 'real world' of veterinary clinics has no funding base to support it"
> (Lanyon, 2014)

## 6.2. What is helping to address the challenges?

**A close dialogue with practitioners will help raise awareness of the existing evidence and can inform the direction of future research. There is recognition within the veterinary profession that a greater collaboration and investment in research is required to create a better evidence base from which to inform clinical decision-making.**

## Collating and analysing existing data

Initiatives to collate data held within clinical record systems (e.g. VetCompass ☐ and SAVSNET ☐) aim to analyse disease trends, interventions and treatments and provide information for academics, clinicians and the public.

## Evidence summaries

These are concise summaries of the best available evidence for a clinical question. Evidence summaries save practitioners time, by allowing them to see the 'clinical bottom line' at the click of a button, and facilitate evidence-based clinical decision-making. Examples of open access evidence summaries are:

- BestBETs for Vets ☐

- RCVS Knowledge's Knowledge Summaries ☐

Perhaps you have a clinical question on which you would like to see a Knowledge Summary written? Submit your clinical query to RCVS Knowledge ☐. Or you might like to have a go at writing your own Knowledge Summary ☐ ?

# 7. How do I start my EBVM journey?

**To make the most of this course, it would be useful to take time now to think about clinical scenarios that relate to your practice, and that you can use throughout the course to apply to the concepts we discuss. You will then be guided through the EBVM cycle, and by the end of the course, you may have answered a real problem that you have encountered!**

## Activity

Think about clinical scenarios that relate to your practice. These could be:

- An area in your clinical practice that you would like to audit
- A recently launched medication/diagnostic test that you are considering using in your cases
- A research paper in a journal that you would like to review.

As you work through each section, try to apply the skills that you are learning to your example.

# 8. Summary

## Learning outcomes

You should now be more familiar with how to:

- explain the concept of EBVM

- construct a generalised example of the EBVM cycle

- describe the relevance, importance and challenges of EBVM to veterinary practice.

**Now move onto the Ask section** →

# 9. References

Dean, R. and Brennan, M. (2016) Dearth of evidence for EBVM. *Veterinary Record*, 179 (10), pp. 258-259

Dean, R. and Heneghan, C. (2019) Do we need an evidence manifesto? *Veterinary Record* , 185 (2), pp. 58-59

Heneghan, C. and Badenhoch, D. (2006) *Evidence-based medicine toolkit*. Second ed. Oxford: Blackwell Publishing

Heneghan, C. et al. (2017) Evidence based medicine manifesto for better healthcare. *BMJ*, 357:j2973

Lanyon, L. (2014) Evidence-based veterinary medicine: a clear and present challenge. *Veterinary Record*, 174 (7), pp. 173-175

RCVS Knowledge and Sense About Science (2019) *Evidence-based veterinary medicine matters: our commitment to the future.* London: RCVS Knowledge

Slater, M. R. (2010) Epidemiological research and evidence based medicine: how do they fit and for whom. *Preventive Veterinary Medicine,* 97 (3-4), pp. 157-164

**Now move onto the Ask section** →

# Ask

# Table of contents

# 1. Introduction



**The first step in practising EBVM is to ask the 'right' question(s).** Without the right question, we cannot search and <u>Acquire</u> the correct evidence for critical appraisal, nor can we establish a context within which we can <u>Appraise</u> its relevance and quality. Only then can we <u>Apply</u> our new knowledge in a clinical context, in order to <u>Assess</u> its impact on our practice.

## By the end of this section you will be able to:

- describe why a well-formed question is fundamental to the EBVM process and avoid the common pitfalls in asking questions

- identify clinical questions in practice

- use the (S)PICO mnemonic to construct a searchable clinical question.

# 2. The importance of starting with a good question

**Questioning our current practice underpins the principles of EBVM – in order to practice EBVM, we must be prepared to question what we do and change accordingly.**

By questioning our practice in a critical way, we can move in a direction that keeps us up to date; also, by using the best possible evidence, we can offer our patients the best possible outcomes.

Well-formed questions underpin the very core of scientific methodology:

> One cannot get a clear answer to a vague question. The language of science is particularly distinguished by the fact it centres around well-stated questions. (Johnson, 1946)

One of the most common mistakes those new to EBVM might make is to start searching for answers with only a vague idea of what information is needed. To address complex or poorly defined clinical problems, you must first break these problems down into a series of more precise questions. By framing your questions in this narrow, precise way, you increase your likelihood of finding evidence that specifically answers your question. The process of formulating these precise questions will focus your thoughts on the problem you are addressing, your clinical choices and outcome values.

**TIP:** In equine medicine, rather than asking "What should I do about recurrent laryngeal neuropathy in horses I see in my practice?", you could ask "In adult, racing thoroughbred horses presenting with recurrent laryngeal neuropathy, does ventriculectomy ('Hobday') with ventriculocordectomy, compared with prosthetic laryngoplasty ('tie-back'), have a greater success rate for return to racing?"

This question could also have many variations: for instance, you could change the outcome you want to measure, and ask "In adult, racing thoroughbred horses presenting with recurrent laryngeal neuropathy, does ventriculectomy ('Hobday') with ventriculocordectomy, compared with prosthetic laryngoplasty ('tie-back'), have a greater reduction in air turbulence?"

# 3. Types of clinical questions

**To benefit both patients and clinicians, questions need to be focused and directly relevant to the patient or scenario at hand.**

Categorising the type of your clinical question can help you to decide which study design would best answer your question and its level of evidence, which becomes important when you begin to appraise the evidence.

In the Appraise section, we will explore the different study types and the levels of evidence in more detail.

Clinical questions can be divided into five main topic areas, relating to:

1. treatment
2. prognosis and incidence
3. aetiology or risk
4. diagnosis
5. prevalence.

## Treatment

These types of questions refer to treatment choices made about patients in practice. These choices can include drugs or medicines to be used, surgical methods, changes in diet or management, and many more. These types of questions are best answered by randomised controlled trials when they are available.

Example: Which diet is best to feed cats with chronic renal disease?

## Prognosis and incidence

These types of questions relate to the likelihood of disease or the progression of disease over time. These questions are best answered by cohort studies.

Example: Does sex affect survival in flat-coat retrievers with cancer?

## Aetiology and risk

These types of questions investigate the origin of disease or the factors influencing development of a certain condition or disease. These questions are best answered by cohort studies, case-control studies or cross-sectional studies.

Example: What are the risks of adverse events in general anaesthesia in ferrets under different protocols?

## Diagnosis

These types of questions involve identification of a disorder based on the animal's presenting signs. These questions are best answered by diagnostic test validation studies (also known as diagnostic evaluation studies).

Example: Which diagnostic test is most reliable for diagnosing fascioliasis in dairy cattle?

## Prevalence

These questions consider the frequency of disease at a certain point in time and are best answered by cross-sectional studies.

Example: What is the prevalence of cardiac disorders in Welsh Section A mountain ponies?

## Stakeholder experiences, preferences and values

We can also ask questions about the experiences, values and preferences of the stakeholders concerned, which, while not necessarily clinical questions, are relevant to the more holistic practice of EBVM.

Stakeholder experiences, preferences and values questions consider a wide range of issues, and no one specific type of study is sufficient to address this general category. Both qualitative, quantitative and mixed method approaches drawn from both social and biological science modalities may be appropriate, and a full guide to this is currently beyond the remit of this course.

# 4. How to construct a good EBVM question?

**A well-formed clinical question is the most efficient route to obtaining a clear answer to the problem or challenge you are interested in. The question you ask needs to be formatted in such a way as to aid you in your search for answers.**

Formatting your question correctly is important in ensuring that your search for evidence is structured, systematic and complete. See the Acquire section of this resource for more details.

Various systems have been developed to assist practitioners in formatting their clinical problems into useful questions, enabling a structured, systematic and complete search of the evidence. The system depends on the type of question being asked.

The most common system used to format a question is the PICO system, focusing on the:

- P – Patient: population and/or problem
- I – Intervention: treatment, or thing of Interest: prognostic factor or exposure
- C – Comparator: comparison or control
- O – Outcome

We will focus on the PICO system in this resource. Sometimes it is adapted to (S)PICO where the 'S' stands for species. You will commonly see PICO used and sometimes SPICO. Species is part of the patient definition (in 'P') but adding the 'S' will ensure you don't forget it.

# 4.1 (S) P – Species, Patient: population and/or problem

**Species - that bit is easy! The next step in formulating a clinical question in the (S)PICO format is to consider the patient and the clinical problem you are faced with.**

It is helpful to think in terms of the population you are dealing with and to characterise your patient in general terms (e.g. a geriatric cat with a diagnosis of chronic kidney disease).

## Table 1: Examples of questions expressed as species, patient and clinical problem

| QUESTION | SPECIES/PATIENT/PROBLEM |
|---|---|
| Which diet is best to feed to cats with chronic renal disease? | Cats with chronic renal disease |
| Which diagnostic test is most reliable for diagnosing fascioliasis in lactating dairy cattle? | Diagnosis of fascioliasis in lactating dairy cattle |
| Does sex affect survival in flat-coat retrievers with cutaneous lymphoma? | Flat-coated retrievers with cutaneous lymphoma |
| Are the risks of inhalational induction of general anaesthesia higher compared to injectable induction ferrets under different protocols? | Ferrets undergoing general anaesthesia |
| Are cardiac disorders in Welsh Section A mountain ponies more prevalent than other breeds? | Horses |

## 4.2 I – Intervention: treatment, prognostic factor or exposure

> **You might be interested in a specific treatment, a factor that will indicate prognosis in a disease process, or the association of a certain exposure with disease, depending on the question.**

These interventions are often considered with their matching comparators – something you might compare against the group receiving the intervention (see the next page for further information about comparators).

### Table 2: Examples of questions expressed as intervention or interest

| QUESTION | INTERVENTION/INTEREST |
|---|---|
| Which diet is best to feed cats with chronic renal disease? | Feeding a renal prescription diet |
| Which diagnostic test is most reliable for diagnosing fascioliasis in lactating dairy cattle? | Milk ELISA |
| Does sex affect survival in flat-coat retrievers with cutaneous lymphoma? | Being male |
| Are the risks of inhalational induction of general anaesthesia higher compared to injectable induction ferrets under different protocols? | General anaesthesia induction by triple injectable agent |
| Are cardiac disorders in Welsh Section A mountain ponies more prevalent than other breeds? | Being a Welsh Section A mountain pony |

# 4.3 C – Comparator: comparison or control

**Now that you have defined your population and intervention of interest, you need to consider your choices (i.e. what the intervention will be compared to).**

It is important to realise that any intervention needs to be considered at the same time as a comparator, as without a comparison it is difficult to evaluate the impact of the particular treatment, prognostic factor or exposure you are interested in.

## Table 3: Examples of questions with comparators

| QUESTION | COMPARATOR |
|---|---|
| Which diet is best to feed cats with chronic renal disease? | Not feeding a renal prescription diet |
| Which diagnostic test is most reliable for diagnosing fascioliasis in lactating dairy cattle? | Serum ELISA |
| Does sex affect survival in flat-coat retrievers with cutaneous lymphoma? | Being female |
| Are the risks of inhalational induction of general anaesthesia higher compared to injectable induction ferrets under different protocols? | General anaesthesia induction by inhalational agent |
| Are cardiac disorders in Welsh Section A mountain ponies more prevalent than other breeds? | Being any other breed of horse |

## 4.4 O – Outcome by which 'I' will be compared with 'C'

> **Choosing a specific desired outcome is a key part of formulating an evidence-based question about a patient.**

This ensures you will Acquire, Appraise and Apply evidence pertaining to the specific outcome of interest for you and your individual patient.

### Table 4: Examples of questions and outcomes

| QUESTION | OUTCOME |
| --- | --- |
| Which diet is best to feed cats with chronic renal disease? | Survival time |
| Which diagnostic test is most reliable for diagnosing fascioliasis in lactating dairy cattle? | Predictive values |
| Does sex affect survival in flat-coat retrievers with cutaneous lymphoma? | Average life expectancy |
| Are the risks of inhalational induction of general anaesthesia higher compared to injectable induction ferrets under different protocols? | Mortality rate |
| Are cardiac disorders in Welsh Section A mountain ponies more prevalent than other breeds? | Prevalence of cardiac disorders |

# 4.5 Example (S)PICO questions

You have now looked at all the elements required to construct a full (S)PICO question.

Below are structured example (S)PICO questions created around the examples from the previous section 'How to construct a good EBVM question?' for the five different types of clinical question.

**Original question:** Which diet is best to feed cats with chronic renal disease?

**(S)PICO: In [cats with chronic renal disease] does [feeding a renal prescription diet] compared with [not feeding a renal prescription diet] impact on [survival time]?**

**Original question:** Which diagnostic test is most reliable for diagnosing fascioliasis in dairy cattle?

**(S)PICO: In [lactating dairy cattle] does the [milk ELISA] compared with [serum ELISA] have better [positive and negative predictive values] for [diagnosing fascioliasis]?**

**Original question:** Does sex affect survival in flat-coated retrievers with cutaneous lymphoma?

**(S)PICO: In [flat-coated retrievers with cutaneous lymphoma], does [being a male] compared with [being a female] affect [average life expectancy]?**

**Original question:** What are the risks of inducing general anaesthesia in ferrets under different protocols?

**(S)PICO: In [ferrets undergoing general anaesthesia], what is the [risk of death] under general anaesthesia induced by [triple injectable agent] compared with the [inhalational agent]?**

**Original question:** What is the prevalence of cardiac disorders in Welsh Section A mountain ponies?

**(S)PICO: In [horses], does [being a Welsh Section A mountain pony] compared with [being any other breed] increase the [prevalence of cardiac disorders]?**

The (S)PICO framework can be applied to most clinical questions and is easy to use once you have learned its salient principles.

# 5. Challenges to building a PICO

Once you have identified your clinical question and created your PICO, there are a few more considerations to inform and re-adjust your PICO and get the results you need.

## Scope versus volume of evidence

The Acquire section, coming next, explains more fully how you can use your PICO question to find the evidence.

Sometimes the question you ask may yield too much or too little relevant evidence. For example, you may find that your PICO has only yielded two papers, neither of which entirely answers your question. Assuming your search was conducted thoroughly, this may mean there is not enough evidence available to answer your question.

On the other hand, you may find that your search yields dozens and dozens of results, not all of which specifically relate to the problem or question you have in mind. In this case, it might be necessary to adjust your PICO to be narrower and more focussed in order to find only the most relevant evidence to answer your question. How you implement the evidence into practice will be further covered in Apply and Assess.

## Choice of interventions and comparators

To cover all interventions, interests and comparators, multiple PICO questions need to be formed (often easier!) or you can choose a more general question. If you choose the latter, then you may end up with more evidence to sift through and the search outputs may become less relevant.

Narrow question: In [dogs with osteoarthritis] is [meloxicam] better than [tramadol] at [reducing pain]?

Wider question: In [dogs with osteoarthritis] are [NSAIDs] better than [tramadol] at [reducing pain]?

## Multiple outcomes

Sometimes, a clear choice for your patient will only have a single objective desirable outcome, and it is certainly nice when this is the case in your clinical question. In reality, however, veterinary professionals often want to investigate a number of different outcomes for ourselves, our clients and our patients. For example, we may wish for a treatment that is effective, safe, easy to use and economic.

Many studies in the literature may address multiple outcomes, looking at both efficacy (e.g. survival times) and negative outcomes (e.g. adverse events) as well as costs, all in the same study. Sometimes you may need to look across multiple studies to gather these data; to do this, you will effectively be asking a series of PICO questions, all with different outcomes. One strategy is to refine your outcome to be a composite statement that reflects your overall aims for a case (e.g. 'long-term survival whilst pain free').

# 6. Example scenarios using the PICO format

**A series of example case scenarios for you to consider are now given.**

For each example, we suggest you attempt to write out a PICO question, and then expand the text to see an example provided in the PICO format.

You can use the tool PICO.vet ⤢ to help you build a well-structured and focused clinical question.

🔖 **Clinical Scenario**

## Carprofen and local anaesthesia in calves undergoing disbudding

During a visit to one of your small beef herds, the owner, Mary Reader, asks you to disbud three calves that have been born within the last few weeks. The last time Mrs Reader had animals disbudded with hot iron cautery, she was upset by how the animals behaved after the procedure – she says they were "out of sorts" and looked uncomfortable.

Whilst Mrs Reader knows the animals must be disbudded, she asks you whether analgesics as well as the local anaesthetic would be likely to reduce the pain from the disbudding. You assure her you always use local anaesthetic, but you wonder if the addition of carprofen would decrease the level of discomfort experienced by the calves.

✖ **(S)PICO question**                                         Click to close

In [calves undergoing non-chemical disbudding] does [the administration of carprofen in addition to local anaesthetic] versus [local anaesthetic alone] [decrease the behavioural indicators of discomfort associated with the procedure]?

**See the full example** ⤢

🔖 **Clinical Scenario**

## Carprofen in dairy cattle with toxic mastitis

During a visit to one of your dairy farms, the owner Steve Jones comments that he has had a number of cows sick with mastitis, which he thinks are caused by E. coli. He finds these cases very difficult to treat.

Steve has recently seen an advert for an anti-inflammatory drug containing carprofen, which claims that it will improve the recovery rate of cows with toxic mastitis. Over the years, you have had a number of conversations with Steve about the relative merits of different treatment options for cases of toxic E. coli mastitis. You wonder if carprofen would make a difference to recovery of cows on Steve's farm.

✖ **(S)PICO question**                                         Click to close

In [dairy cattle with E. coli mastitis] does [the administration of carprofen] compared to [no anti-inflammatory treatment] [improve clinical recovery]?

**See the full example** ⤢

## Clinical Scenario

### Anchoring versus pocket technique for surgical repair of cherry eye in dogs

You are presented with a 1-year-old Beagle with a unilateral cherry eye. It has been present for two months and is not bothering the dog. The owner wants to know what to do. You ring the two veterinary ophthalmologists in the local area for advice. One routinely performs an anchoring technique, whilst the other has had good results with a mucosal pocket technique. Having only two expert opinions to go by, you decide to look for any available higher-level evidence.

> **✖ (S)PICO question**                                         Click to close
>
> In [dogs undergoing surgery for repair of a prolapsed gland of the third eyelid (cherry eye)], is [a pocket technique] superior to [an anchoring technique] in [preventing recurrence]?
>
> **See the full example** ↗

---

## Clinical Scenario

### Renal diets in cats with chronic kidney disease

Chloe, a 14-year-old domestic shorthaired cat, has just been diagnosed with IRIS late stage II kidney disease. She is not proteinuric, and her blood pressure is normal. You have stabilised her azotaemia, and her appetite is now good. What is the benefit of a kidney prescription diet for this cat?



> **✖ (S)PICO question**                                         Click to close
>
> In [cats with naturally occurring chronic kidney disease] does [a renal prescription diet] compared to [normal diet] increase the [survival time] of affected cats?
>
> **See the full example** ↗

# 7. Quiz

1. When constructing a question in the (S)PICO or PICO format, what does the letter O stand for?

○ Opportunity

Incorrect

○ Option

Incorrect

○ Order

Incorrect

○ Outcome

Correct. The letter O stands for Outcome.

○ Outline

Incorrect

[Check answer]   [Show answers and explanations]

2. Construct a (S)PICO to answer the question: Which surgical technique should be used to repair a cranial cruciate ligament (CCL) rupture in a Labrador?

○ Does [surgery] provide a [good recovery] in [Labradors] with [CCL rupture]?

Incorrect. This question is not in the (S)PICO format. The question is out of order and the population, intervention and outcome are ill-defined and there is no control or comparator. The correct format for this question is 'In [dogs over 25 kg with CCL rupture] does[tibial plateau levelling osteotomy] compared with [lateral fabellar suture] have a [greater chance of return to normal limb function]?'

○ In [dogs over 25kg with CCL rupture] does [tibial plateau levelling osteotomy] compared with [lateral fabellar suture] have a [greater chance of return to normal limb function]?

Correct. This (S)PICO is written in the correct order and the population (including species), intervention, control and outcome are well defined.

○ In [dogs] does a [tibial plateau levelling osteotomy] work better than [lateral fabellar suture] for [CCL rupture]?

Incorrect. The population is ill-defined and there is no outcome to measure. How do you define 'work better'? The correct format for this question is 'In [dogs over 25 kg with CCL rupture] does [tibial plateau levelling osteotomy] compared with [lateral fabellar suture] have a [greater chance of return to normal limb function]?'

○ In [large dogs] is [tibial plateau levelling osteotomy] superior for correcting [CCL rupture]?

Incorrect. Although the population is slightly more defined, what does 'large dog' mean? There is no comparator or control mentioned and there is no specific outcome measured. The correct format for this question is 'In [dogs over 25kg with CCL rupture] does [tibial plateau levelling osteotomy] compared with [lateral fabellar suture] have a [greater chance of return to normal limb function]?'

○ [Which technique] provides the [best outcome] for [CCL rupture]?

Incorrect. This (S)PICO is not correctly formatted, there is no defined population – we could be talking about humans here! The correct format for this question is 'In [dogs over 25 kg with CCL rupture] does [tibial plateau levelling osteotomy] compared with [lateral fabellar suture] have a [greater chance of return to normal limb function]?'

[Check answer]   [Show answers and explanations]

3. How should you approach a clinical question with multiple possible interventions or outcomes?

○ Construct a series of (S)PICOs, each containing one comparator and one outcome, until all questions are answered.

Correct. Because a (S)PICO must be formatted very carefully, in order to assess multiple interventions or outcomes we should construct individual (S)PICO questions for each comparator and outcome. If done systematically this will lead us to the clinical bottom line that answers our question.

○ Expand the (S)PICO to contain all of the relevant comparators and outcomes.

Incorrect. A (S)PICO will not work as it is meant to if you expand it to contain all possible interventions and outcomes. This means when we attempt to Acquire our information, we will not find all of the evidence available to us to answer this question correctly.

○ Expand the (S)PICO to contain some, but not all of the extra comparators and outcomes.

Incorrect. A (S)PICO will not work as it is meant to if you expand it to contain more interventions and outcomes. This means when we attempt to Acquire our information, we will not find all of the evidence available to us to answer this question correctly.

○ Ignore the other comparators and outcomes; one is enough to get the best evidence.

Incorrect. If your question has multiple interventions and outcomes you can only reach an answer by including all of the interventions and outcomes and systematically breaking the question down into individual (S)PICOs.

○ It is not possible to use the (S)PICO format for questions with multiple comparators or outcomes.

Incorrect. Because a (S)PICO must be formatted very carefully, in order to assess multiple interventions or outcomes we should construct individual PICO questions for each comparator and outcome. If done systematically this will lead us to the clinical bottom line that answers our question.

Check answer      Show answers and explanations

# 8. Summary

## Learning outcomes

You should now be more familiar with how to:

- describe why a well-formed question is fundamental to the EBVM process and avoid the common pitfalls in asking questions

- identify clinical questions in practice

- use the (S)PICO mnemonic to construct a searchable clinical question.

**Now move onto the Acquire section** ➜

# 9. References

Cockcroft, P. D. and Holmes, M. A. (2003) *Handbook of Evidence-based Veterinary Medicine*. Oxford: Blackwell Publishing

Johnson, W. (1946) *People in quandaries: the semantics of personal adjustment.* New York: Harper & Row

Lanyon, L. (2014) Evidence-based veterinary medicine: a clear and present challenge. *Veterinary Record*, 174 (7), pp. 173-175

**Now move onto the Acquire section** →

# Acquire

# Table of contents
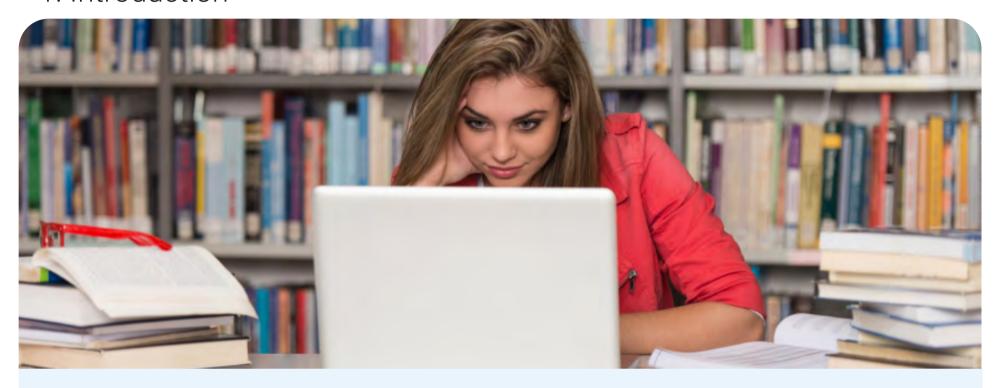
# 1. Introduction



**The Ask section helped you to refine a clinical question. The next step is to learn how to Acquire evidence to help answer that question.** EBVM involves finding the best available scientific research to help minimise bias in clinical decision-making. However, scientific publishing is big business, and not everyone will have access to all the information for free.

This section will guide you to some of the best sources of evidence, and help you identify which you can access. It will also advise on searching for evidence in a systematic way, to ensure you find the best evidence that is available to you.

By the end of this section you will be able to:

- identify the best sources of veterinary evidence
- establish which sources you have access to
- search for evidence
- manage your search results.

# 2. Acquiring evidence

Formal methods for searching for evidence have been developed to try and maximise retrieval of the best available evidence and to minimise bias in clinical decision-making.

Evidence searches aim to be systematic. They follow standardised methods so that as much as possible of the relevant evidence is reviewed, rather than the reader consulting the most easily available evidence or hand-picking evidence that supports a pre-existing, potentially biased, approach.

Evidence searches draw on the well-established methodology of evidence-based human medicine (EBM). Standards for reporting an evidence search have also emerged, allowing searches to be explicit and reproducible so that others can assess whether decisions were well founded, and whether new evidence has emerged that might necessitate a change in clinical practice.

The Ask section introduced the first step – to pose your clinical question in a structured way, demonstrated with the PICO format (or SPICO when species is included with patient). The next step is to build a search strategy, which means choosing the best sources of evidence and searching those sources in the most efficient way.

This Acquire section will describe those methods for searching and reporting in some detail, with a view to giving comprehensive advice, but it is recognised that different advice is needed for those in universities, and those who are vets in practice; and for those doing a quick evidence search for a clinical setting and those wishing to publish an evidence review. Decide what your searching requirements are and navigate to the most relevant sections.

It can help to look at some examples of best practice in evidence searches, to see what we are aiming for.

To see examples, take a look at the search strategies reported from Veterinary Evidence ⬀ and BestBETs for Vets ⬀ using the links below.

---

✖ **Cats**    Click to close

Should Levetiracetam or Imepitoin be used in preference as second-line treatment in pharmacoresistent epileptic cats? ⬀

Midline versus flank approach and pain in neutering of cats ⬀

---

✖ **Cattle**    Click to close

Does pasteurising colostrum reduce Johne's disease morbidity in adult cattle? ⬀

Are sand or composted bedding cubicles suitable alternatives to rubber matting for housing dairy cows? ⬀

---

✖ **Dogs**    Click to close

In cats and dogs does laparoscopic ovariectomy offer advantages over open ovariectomy for postoperative recovery? ⬀

Do palliative steroids prolong survival in dogs with multicentric lymphoma? ⬀

**✖ Horses**    <span style="float:right">Click to close</span>

Do oral or minimally invasive cheek tooth extraction techniques reduce the incidence of post-operative complications in the horse when compared to repulsion methods? ↗

Does tendon firing quicken time to recovery for superficial digital flexor tendon injury? ↗

**✖ Poultry**    <span style="float:right">Click to close</span>

Is diatomaceous earth efficacious at reducing red mite (Dermanyssus gallinae) burden in the domestic chicken? ↗

**✖ Rabbits**    <span style="float:right">Click to close</span>

Comparison of 0.2 Mg/kg Vs.1.0 Mg/kg of oral meloxicam for safe and effective analgesia in domestic rabbits ↗

Selamectin versus ivermectin for Cheyletiellosis in pet rabbits ↗

**✖ Sheep**    <span style="float:right">Click to close</span>

Does whole flock gamithromycin treatment reduce the prevalence of footrot in sheep? ↗

Effect of ventral versus flank approach in caesareans on ewe mortality ↗

# 3. What sources of evidence are there?

**Where can evidence be found to help answer clinical questions?**

EBVM links the results of research to the practice of veterinary medicine, so we need to know where to find the best, most relevant research for each clinical question.

It is helpful to understand the difference between primary and secondary sources, and between published information and grey literature:

## 1. Published scientific research

### Primary sources

Primary sources of evidence offer a first-hand account of research or practice written by those who were directly connected to it. In EBVM this typically means journal articles, reports or conference papers that describe:

- research studies (quantitative and/or qualitative)
- clinical trials
- case studies and case reports.

### Secondary sources

Secondary sources are created later by third-party authors who summarise or synthesise primary sources and often comment on them. These are discussed in more detail in the Secondary sources section and include:

- evidence syntheses (including systematic reviews, meta-analyses and evidence summaries e.g. Knowledge Summaries)
- clinical practice guidelines
- textbooks and manuals.

## 2. Grey literature

Grey literature is research material that is not formally published within the conventional, commercial publishing channels. Examples include:

- reports and working papers (e.g. from government agencies)
- theses and dissertations
- lecture notes
- websites, blogs and social media posts.

Traditionally, peer-reviewed scientific journals, and the bibliographic databases that index them, have been considered the best source of evidence. Research into publication bias (Glanville et al., 2015) suggests a need to go beyond these sources alone, as a proportion of research will not be published in peer-reviewed journals.

You may have access to books, conference papers or case reports…and clinical records and practice data are already being used to help veterinary professionals make evidence-based decisions at the point of care (Brodbelt, 2014).

The key is to use the best evidence available to you.

# 3.1 Secondary sources

**How can secondary sources help vets to be evidence-based?**

A vet in practice may not have the time to do a detailed search of the primary research literature, but EBVM can help by providing secondary sources that synthesise the best available evidence to give practitioners quick answers to clinical questions.

For those with more time, EBVM provides standard methodologies to systematically search for and analyse scientific studies to answer a clinical question and create outputs that can benefit the professional community.

The main outputs of EBVM are evidence syntheses:

## Systematic reviews

Systematic reviews of the scientific literature aim to find every single scientific study relating to the PICO question, allowing you to draw recommendations from the widest body of evidence.

A systematic review is performed in a highly structured way, with the question and methods clearly defined in advance to try to minimise any bias that the reviewer may have in selecting and interpreting the research.

## Meta-analyses

Sometimes the systematic review is extended to include an analysis of the quantitative data sets from the research studies found (where they are sufficiently homogeneous) to provide a single estimate at the end with an indication of the confidence limits that can be applied to the combined data.

## Evidence summaries

A full systematic review is a major undertaking and typically involves a team of people, taking many months to complete, and so simpler methodologies have emerged to create quick and achievable summaries of the current best evidence for a clinical question. These can have different names, such as:

- Knowledge Summaries
- Critically Appraised Topics (CATs)
- BestBETs.

## Clinical practice guidelines

Clinical practice guidelines are concise recommendations for healthcare professionals on how to care for patients with specific conditions, which are often based on systematic reviews or evidence syntheses.

Clinical guidelines provide a quick and easy way for busy practitioners to ensure their clinical decisions are based on the best available evidence without having to do the legwork of EBVM themselves.

Read more about how to produce these for your practice in Apply.

## Manuals, textbooks and other publications

Systematic reviews and evidence summaries are still relatively uncommon in veterinary medicine, and so you will often need to search other sources, such as textbooks or the primary literature. Although textbooks and manuals use less formal methods and may not contain the most up-to-date evidence, they can still contain valuable information, and may be the best source of evidence available to answer some questions.

Read more about the Levels of Evidence in the Appraise section .

## Evidence-based medicine: formal methodologies

For those wishing to create systematic reviews or evidence summaries, formal methodologies have been developed to provide standards to minimise bias.

Two key sources to be aware of:

- The Cochrane Handbook for Systematic Reviews of Interventions ↗ outlines the formal methodologies developed for evidence-based (human) medicine, developed by Cochrane. ↗
- How to Write a Knowledge Summary ↗ shows how the Cochrane methods have been adapted for the veterinary profession by RCVS Knowledge.

A special issue of the journal *Zoonoses and Public Health* focuses on the methodology and is freely available online: Systematic Reviews and Meta-Analysis in Animal Agriculture and Veterinary Medicine ↗.

## Where you decide to search for EBVM will depend on what you are looking for:

**If you are a busy practitioner**, you may just want to do a quick search for evidence that others have written to see if there is a quick answer to your question. Ideally you are looking for an evidence synthesis, but in the absence of this, then you may turn to primary sources.

**If you are a student or researcher, or a practitioner with more time**, you might want to learn the formal methodologies of EBVM and do a comprehensive search to create a new systematic review or evidence summary.

# 3.2 Evidence syntheses

**What are the key sources of secondary evidence for veterinary sciences?**

Your first search should be for secondary evidence, as if there is already a high-quality, up-to-date systematic review or evidence summary already published, there may be no need to search any further.

Evidence syntheses are a relatively new development for the veterinary profession, but more are being published each year, with growing collections now available online.

## Evidence summaries

**Freely available:**

Although there are still only relatively small numbers, two key places to search are:

- *Veterinary Evidence* ⤤ — an online, open-access, peer-reviewed journal that publishes EBVM articles, including Knowledge Summaries and systematic reviews. It is published by RCVS Knowledge, the charity partner of the Royal College of Veterinary Surgeons (RCVS) in the UK.
- BestBETs for Vets ⤤ — a freely accessible database of Best Evidence Topics (BestBETS). It is published by the Centre for Evidence-based Veterinary Medicine at the University of Nottingham, UK.

**Subscription required:**

- *Veterinary Record* ⤤ – this UK journal has a regular column called 'Clinical Decision-Making' which includes evidence syntheses.
- *Equine Veterinary Journal*: Clinical Evidence in Equine Practice ⤤ online collection lists systematic reviews and critically appraised topics.
- *Zoonoses and Public Health* ⤤ Special issue: systematic reviews and meta-analysis in animal agriculture and veterinary medicine.

## Systematic reviews

Systematic reviews are considered the highest level of evidence. If you can find a recent systematic review that answers your specific question this will be a great help, as someone else has already spent the time doing the search and appraisal work for you.

The Cochrane Database of Systematic Reviews ⤤ is a key source of systematic reviews in human medicine, and there is now a will in the veterinary community to try and build something comparable. In these early days of EBVM, a direct comparator of Cochrane does not exist for veterinary medicine, but the VetSRev database (see below) has been up and running since 2013.

The **VetSRev database** ⤤ is a freely accessible online database of citations for systematic reviews relevant to veterinary medicine and science. Produced by the Centre for Evidence-based Veterinary Medicine at the University of Nottingham, UK, it aims to disseminate information about existing systematic reviews to the veterinary community. You may be surprised by the number that already exist, and the number published each year is growing.

# Clinical practice guidelines

Clinical practice guidelines can be evidence-based if they are based on a review of the literature and critical appraisal of the evidence. See the Assess section for more information.

Examples include:

- Treatment of canine atopic dermatitis: 2015 updated guidelines from the International Committee on Allergic Diseases of Animals (ICADA) ↗.

- The RECOVER guidelines on veterinary CPR, the first evidence-based recommendations to resuscitate dogs and cats in cardiac arrest, produced by the American College of Veterinary Emergency and Critical Care and the Veterinary Emergency and Critical Care Society ↗.

- AGREE provides tools for the creation and evaluation of clinical practice guidelines ↗.

> Most GPs in human medicine use systematic reviews, evidence summaries, and guidelines to answer their clinical questions. They don't do many, if any, searches of the primary literature themselves. For example, in the UK they may rely on NICE Evidence Search. ↗

# 3.3 Primary sources

> **When would it make sense to search the primary sources?**

If no secondary evidence exists in an evidence summary or systematic review, then it might be helpful to search the primary sources. Searching the primary sources is essential for those creating an evidence synthesis themselves.

> "Veterinary practitioners may believe that there is not enough time to search for science-based information while managing cases, but these perceptions often change after experiencing the effect this new-found knowledge has on treatment response by the patient." (Gibbons and Mayer, 2009)

The EBVM methodology developed when scientific research studies were published online, and when sophisticated search tools made focused searching possible.

## Bibliographic databases

Bibliographic databases are search tools designed to help you search across the research literature (journal articles, books, conference papers, etc.).

They can focus on a particular subject area or be interdisciplinary. Each database systematically indexes articles from a given list of journals and other scholarly and professional publications, and so provides the most effective and efficient means for searching the scientific literature.

Each database searches a different set of journals and publications, but they are explicit about their coverage and you can check to see what is included.

It should be remembered that databases are tools to identify relevant papers. While some databases contain full-text articles, many do not, and so you will also need to find ways to access the papers you wish to read; how to do so is covered later in this section.

## Journals

If you don't have access to subscription databases then you can refer directly to the journals that you do have access to, acknowledging that you will not be retrieving the broad spectrum of evidence.

# 3.4 Bibliographic databases

**What are the key databases for veterinary searches?**

Key databases that index journals relating to veterinary sciences are listed below, with an indication of subject coverage and access. Links to the publishers' websites are also given, where further information about each database can be found.

The database CAB Abstracts ⧉ has been shown to give the greatest percentage coverage of journals with veterinary content: 90.2% (Grindlay et al., 2012), and so would be seen by many as the key database for EBVM.

However, given the interdisciplinary nature of veterinary sciences, journals from other biomedical disciplines may also provide useful evidence, alongside the veterinary-specific journals. Therefore, to ensure that you retrieve as much of the published evidence on your topic as possible, you should use CAB Abstracts and then at least one other database.

RCVS Knowledge ⧉ asks authors of Knowledge Summaries to search **CAB Abstracts** (1973–current) and **PubMed** as a minimum. Note: if you only use PubMed, you risk missing a large proportion of veterinary journals that are not included in PubMed.

**✚   Table 5: Bibliographic databases**

| DATABASE/ACCESS INFORMATION | ACCESS | SUBJECT COVERAGE |
|---|---|---|
| CAB Abstracts ⧉ | Subscription required | Applied life sciences, including agriculture, and veterinary and food sciences. |
| VetMed Resource ⧉ | Subscription required (cheaper alternative) | This is a multifaceted resource designed for individual or practice-level subscriptions. It includes the veterinary subset of CAB Abstracts. |
| PubMed ⧉ | **Free** | Broad biomedical sciences, with focus on human medicine. Includes some veterinary journals. (See also MEDLINE below.) |
| MEDLINE ⧉ | Subscription required | Broad biomedical sciences, with focus on human medicine. Includes some veterinary journals. (Similar content to PubMed, but available via different delivery platforms, some of which offer enhanced search functionality.) Read about the overlap between PubMed and MEDLINE. ⧉ |
| Web of Science Core Collection ⧉ | Subscription required | Interdisciplinary citation database |
| Scopus ⧉ | Subscription required | Interdisciplinary citation database |
| BIOSIS Citation Index ⧉ | Subscription required | Biological sciences |
| Embase ⧉ | Subscription required | Biomedical and pharmaceutical subjects |
| Zoological Record ⧉ | Subscription required | Zoology and animal science |
| PubAg ⧉ | **Free** | Production animals and animal welfare |

For examples of 'Journals List' which indicates the scope and subject coverage of a database, see the [List of Journals Indexed for MEDLINE](#) ⬈ or the [Veterinary Journals Indexed in PubMed](#) ⬈.

> Because veterinary research is published throughout a broad range of veterinary, agricultural, human medical, and basic science journals, no one database comprehensively provides indexing and abstracting to all literature relevant to the clinical question. Thus, careful searching using a wide variety of information resources is required.  (Murphy, 2007)

## Additional sources of evidence

There are, of course, other sources of veterinary evidence, but we cannot include everything here. Some useful lists exist:

- [RCVS Knowledge: sources of evidence](#) ⬈ – maintained by the library staff at RCVS Knowledge

- [Veterinary Science Search and Veterinary Information Resources](#) ⬈ – maintained by the U.S. National Library of Medicine

- [Information for Veterinary Professionals](#) ⬈ – maintained by Texas A&M University.

## Database delivery platforms and interfaces

Some of the databases listed above are available to purchase from different database providers and via different platforms. The different delivery platforms can offer different search interfaces, which may offer enhanced functionality (e.g. clearer presentation of Subject Headings). When reporting a database search, it is important to mention the platform you accessed it on to enable the search to be peer-reviewed and replicated (as different platforms can require different search strategies for optimum searching). Some of the main platforms, with links to the suppliers, are given below:

- [EBSCO](#) ⬈

- [Ovid](#) ⬈

- [ProQuest Dialog](#) ⬈

- [Web of Science](#) ⬈

# 3.5 Internet search tools

**Can't we just rely on internet search tools like Google or Google Scholar for finding evidence?**

To some extent this depends on you and how much time you have to browse the internet for information and analyse what you find, to decide whether or not you can trust it. If internet searching is your only option, it is better than nothing!

Some of the key issues are:

**✖ A lack of peer-review on the internet**                                    Click to close

General internet search tools do not confine themselves to peer-reviewed information from the academic and scientific communities and so, while they will include links to some high-quality evidence, the amount of time it will take to locate this amid everything else that is listed can make them inefficient. The onus is on you to learn how to search them efficiently, and to sift through the results and analyse them to discern the validity and currency of the evidence.

**✖ Search engines cannot discriminate predatory journals**                    Click to close

Disreputable publishers, sometimes referred to as 'predatory', have emerged online in recent years. They exploit the open access model of publishing where the author pays an Article Publishing Charge (APC). The disreputable publisher takes the money but fails to follow through with the peer-review and editing process that is the standard expected from a reputable scientific journal. This has led to a proliferation of freely available poor-quality research. While these 'predatory journals' usually would not meet the inclusion criteria for databases such as MEDLINE, they are included in Google search results. Again, it would require time and effort to weed out articles from predatory journals from your Google results. Databases can offer an efficient means of avoiding articles from predatory journals.

## How can I investigate the quality of this journal?

- Is the journal indexed in bibliographic databases like PubMed ↗ ?
- Is the journal listed in DOAJ ↗: the Directory of Open Access Journals?
- Use the tools and strategies from Think Check Submit ↗

**✖ We cannot be sure search engines search across all the relevant journals systematically or comprehensively**                                                Click to close

Using search engines, you run a risk of missing key evidence, because these tools do not take a systematic approach to indexing in the way bibliographic databases do.

- If your results include an article from a journal, you cannot presume that the search engine looked at all the articles and all the issues of the journal.
- The most useful results may not be first in the list; the results list may give higher ranking to some items because they are paid to.
- The relevant, quality results can be swamped by low-quality results, so it can be very hard to pinpoint what you need.
- Search engines often link to a finite number of results; if key resources were to come lower down the list, we might miss them.

## ✖ The inability to reproduce your search and results

Those producing an evidence synthesis need to report the search strategy, so that it is explicit and reproducible. This is not possible with internet search engines like Google, for reasons described below.

Internet search engines and bibliographic databases work in different ways, and while brilliant for finding information generally, search engines have imitations for EBVM.

## ✖ Google

Google ☐ crawls the internet and retrieves results using an algorithm which, for commercial reasons, is a closely guarded secret. We do know Google uses robots rather than biomedical graduates to populate its indexes and does not publish a Journals List we can check to see if key journals in our field are being included, so we cannot be sure it indexes all the relevant journals.

While great for searching for information generally, Google generates searches that are not reproducible – the ranking of search results on Google are subjective and vary according to IP address, location, and previous search history (i.e. which computer is used, where it is located geographically, and the previous searches conducted on it). This cannot be used for situations where a search should be explicit and reproducible, such as that used to produce an evidence synthesis.

## ✖ Google Scholar

Google Scholar ☐ is a search engine, not a bibliographic database, but it indexes articles. This means it can reveal useful results, but unlike bibliographic databases, it does not publish a list of the sources it is searching, so we cannot say with confidence we have performed a systematic search of all the relevant veterinary journals.

It searches the full text of web resources, so may retrieve results not found via bibliographic databases (which search the bibliographic data only, e.g. author, title, abstract, keywords). It can also be useful for citation searching.

## ✖ Wikipedia

Google will often give you results from Wikipedia ☐, the online encyclopaedia written collaboratively by internet volunteers. Wikipedia has some great research-based information on it, but anyone with internet access can make changes to Wikipedia articles, and people often contribute anonymously using a pseudonym. This has pros and cons: it can be updated very quickly, and articles are dynamic and so can be updated to reflect new evidence. However, the quality of articles depends on the skill and knowledge of individual authors, which can be hard to ascertain from anonymous contributions.

Databases are more reliable than internet search engines since they focus on scientific literature and list the sources they search. Although internet search engines are free, they are less reliable.

Some bibliographic databases are freely available and will provide a more robust search of the evidence when compared to internet search engines.

# 4. How do I access the evidence?

> **How can we access the evidence, given that it isn't always free?**
>
> Scientific publishing is big business and so many of the key sources of information will not be free for everyone to access. It helps to be aware of the different access models.

Databases are generally just a search tool – they contain *details of publications* but *not the full text* of the publications themselves. There is therefore a two-step process to acquiring evidence via bibliographic databases:

- getting access to databases
- getting access to the full-text of the publications.

Many of the databases and journals needed for EBVM are not free to access. However, there are various strategies for gaining access.

## Paywalls

A paywall is a means of restricting access to online information content to those who have paid for it.
You may find details of databases and journal articles on the internet, but then find you cannot access them because the publishers have put up a paywall. They may ask you to log in with a username or password, which will only work if a payment has been made, or they may ask for a payment there and then.

## The role of libraries and librarians

One of the main roles of the modern library is to pay for subscriptions to online journals and databases so that all the members of that library can get free access. Joining a library can be a considerable support to the practice of EBVM. Librarians and information professionals support EBVM through:

- training in literature searching
- one-to-one support for developing a search strategy
- help with retrieving the full text of journal articles.

See <u>What are the best options for accessing evidence if you are a vet in practice?</u> (Acquire 4.2) for more information.

## Institutional subscriptions

Organisations without a library can buy a subscription to journals and databases for members of that organisation to access. The subscription price can vary depending on the number of people who will have access. Institutional subscriptions are used by research centres, companies, and veterinary practices.

## Individual subscriptions

Individual veterinarians or researchers can buy a subscription to journals for their own personal use.

## Pay-per-view

Journal publishers may offer the opportunity to purchase access to individual articles, on demand as needed. It is convenient and may save money compared to subscriptions, or prove expensive; it depends on what is purchased and how often.

## Renting articles

There are services, such as Deep Dyve ⇗, that provide, in essence, the ability to rent articles. These are generally 'freemium' payment models, with searching and article abstracts representing the free portion and access to the full articles representing the premium portion.

## Open access

There is a strong will among many in the scientific community to make publications open access ⇗, with free and unrestricted access online.

Many research councils are now making it obligatory for the publications arising from the research that they fund to be made available open access, and so it is likely that this trend will grow in future years. Some journals are purely open access, but some traditional journals make individual articles available as open access if the author of the article pays a publication fee.

Veterinarians can gain a lot from the open access movement – as it grows, more and more sources of evidence will become freely available to all.

> **We can all contribute to the open access movement by publishing our research open access whenever possible!**

# 4.1 For those in universities

**It's a huge advantage to have access to a university library, as it will give its members free access to databases and journals.**

University and college libraries spend a large proportion of their budget, sometimes literally millions, on such subscriptions to databases and electronic journals (eJournals). Libraries sign licensing agreements with the publishers that mean they can legally only give access to their constituent members.

If you are a member of a university, be sure to use its library for your EBVM.

## Visit the library website

You can usually find out which databases and journals you have access to via your library catalogue or website.

## Contact your librarians

Librarians have knowledge and expertise and can provide:

- training in literature searching
- one-to-one support for developing a search strategy
- help with retrieving the full text of journal articles.

## Make the most of your library membership while you have it

When you leave university, you lose your library membership and access, so make the most of it while you are there.

## See if there are any options for retaining library membership

If at any point in your career you undertake a professional development course at a university, find out if this gives you library access – it might, even if you are part time or a distance-learner.

Libraries can sometimes include affiliated members of the university in their membership, so if you are working at a university but will leave, find out if you can be awarded visiting or honorary status that maintains your library access.

Some university libraries offer visitor membership, but this rarely includes access to online resources due to the licence agreements.

## 4.2 For vets in practice

> **What are the best options for accessing evidence if you are a vet in practice?**

Veterinary practices and individual veterinarians need to investigate practical affordable strategies to access the best available evidence.

In human medicine in the UK, doctors rely on National Health Service (NHS) library services to provide access to much of the evidence they need for EBM. The lack of an equivalent to the NHS in the veterinary community means that there is no national body to pay for access to the databases and peer-reviewed journals that hold some of the most useful scientific evidence, and so alternative routes must be found. This is one of the key challenges for members of the veterinary profession looking to take EBVM forward.

Here is a great article by Jake Orlowitz from Wikipedia that offers advice on getting access, including how to find open access journals and free legal copies of journal articles online: <u>You're a Researcher Without a Library: What Do You Do?</u> ⤢

In summary, some of the key options for veterinarians to consider are listed below.

## Database options

### Use the free databases to search the evidence

<u>PubMed</u> ⤢ and <u>PubAg</u> ⤢ are both free to search, but of course many of the articles they index will still be behind paywalls. But they would be good places to start if you have limited access to veterinary databases. Google Scholar is another free option.

### A cheaper alternative to CAB Abstracts

The key database, CAB Abstracts, is costly, and for this reason the publishers, CABI, have created a derivative product that is more affordable for veterinary practices:

- <u>VetMed Resource</u> ⤢ contains a sub-set of the records in CAB Abstracts selected for their relevance to vets. It is said to have a similar percentage coverage of the veterinary journals to CAB Abstracts. The only loss might be that it does not include some interdisciplinary journals that might be relevant to some veterinary questions (e.g. relating to agriculture and the environment).

## Investigate library access

If you are looking to create an evidence synthesis or do a systematic search of the literature, you should consider joining a library that can give you the access you need, or that has librarians or information professionals who can manage the search and retrieval for you.

In the UK, <u>RCVS Knowledge Library & Information Services</u>⤢ aims to support veterinarians in their EBVM by providing individuals with access to veterinary databases and journals for a membership fee. The Information Specialists offer a literature search and document supply service, which gives practitioners the opportunity to conduct systematic searches of the veterinary literature.

This may well prove an economical way for vets and vet nurses worldwide to gain access to the key databases and full-text articles. Members acquire access to most veterinary journals, including *Veterinary Clinics of North America*, *Journal of the American Veterinary Medical Association* and *Veterinary Surgery*. Even if you are not a member, the RCVS Knowledge Library can provide you with copies of articles at a cheaper rate than most pay-per-article options on publisher websites. If the RCVS Knowledge Library cannot provide access to the article you need, it can usually get it from another library.

**✖  Use your university libraries access**                           Click to close

If you are a student, staff, or faculty at a university, your university login can provide the physical and online library resources and services. These include journal and bibliographic database subscriptions and assistance from professional librarians. Depending on the university, adjunct faculty may also qualify for library benefits.

**✖  Visitor access to university libraries**                           Click to close

Many libraries allow those without membership to use the library, whether they are residents of the area, or visiting. For example, in the UK, visitors to the Oxford University Libraries may apply for a **reader card** ⧉ for a fee. In the US, land-grant status universities often allow visitors to use the resources in person at no cost.

**✖  Check with your public library**                           Click to close

Ask your public library what bibliographic databases and online journals are provided. Sometimes veterinary journals are included in interdisciplinary packages that the library subscribes to!

**✖  Use your public library's interlibrary loan service**                           Click to close

For a small fee many public libraries can order many different publications, including journal articles, for you.

**✖  Use national libraries**                           Click to close

Some offer national schemes to help get access to subscription resources. For example, vets resident in Scotland should be able to access some eResources by registering with the **National Library of Scotland** ⧉ . Anyone can request a **British Library Reader Pass** ⧉ and use materials while at the library in London.

**✖  Find a veterinary library**                           Click to close

The **International Directory of Veterinary Medical Libraries** ⧉ is available from the Veterinary Medical Libraries Caucus of the Medical Library Association.

## Consider benefits of your professional membership

Most vets and vet nurses have at least one professional membership, and benefits may include journal or database access.

Ask what your membership provides

Be proactive

Tell them EBVM support is important to you

Lobby for additional benefits

## Examples of member benefits

- RCVS Knowledge ↗ : membership of the library is open to all veterinary professionals. See more information above.

- British Small Animal Veterinary Association ↗ : VetMed Resource, BSAVA manuals, formulary

- American Veterinary Medicine Association ↗ : journal subscriptions

- British Veterinary Association ↗ : journal subscriptions and online resources

- European Society of Veterinary Dermatology ↗ : *Veterinary Dermatology* and more than 20 other journals

## Pay for access

### Subscribe to key journals or pay-per-view

As a practice or individual, once you have identified the journal titles that publish the best evidence in your field of practice, you could set up an online subscription (which would often enable you to search the backfiles as well as the current issue). Failing that, you could just set a budget to pay-per-view for the articles you need.

# 5. How do I search for the evidence?

> **Having identified the best sources of scientific literature that you have access to, you then need to conduct a search for suitable studies to answer your question.**

### Search strategy

You need to develop a search strategy so that you can be systematic in your searching and find as many of the relevant studies as possible, without missing any.

## For those aiming to publish evidence syntheses

Evidence searches should be thorough, objective and reproducible, using a range of sources to identify as many studies as possible (within resource limits), to minimise bias and achieve reliable estimates of effects (Higgins et al., 2019).

## For those using evidence, e.g. busy practitioners

A lack of time, funds, expertise, access to technology or resources need not negate an evidence search; we simply need to be as systematic as possible within the practical constraints we have. (Levay and Craven, 2019).

## For those wishing to learn how to search the primary literature themselves

### Start with a great question!

## Consult EBVM Toolkit 2: Finding the Best Available Evidence

This guide ⬈ was written by RCVS Knowledge Library staff to give a simple overview of best practice methods. It explains how to convert your PICO into a search strategy – take a look to see an example of how to do this. Also read the Ask section of this course.

### Move onto searching!

It is worth investing some time in learning how to search bibliographic databases effectively. Understanding key principles of searching can help, but each database works in a slightly different way, so you need to learn how to use each different database.

## Teach yourself how to search 📅 ⏱

Online training tutorials, guides and help pages from the database publishers can be a great source of help and they're always there, whenever you are working 24/7/365!

## Examples of free, online database training guides:

- PubMed for Veterinarians ⬈ : an online tutorial by librarians at Texas A&M University.
- PubMed online training from the US National Library of Medicine ⬈
- Ovid ⬈ : online training for MEDLINE and Embase
- Scopus ⬈ : Learn and support, YouTube tutorials
- Web of Science ⬈ : training and support for Web of Science, EndNote, and Kopernio YouTube tutorials ⬈
- CAB Abstracts – Resources for Database Users: ⬈ schedule of live webinars, recorded webinars, and systematic review tools for CAB Abstracts on OVID and CAB Direct
- VetMed Resource training videos ⬈ from CABI Publishing

**TIP:** Don't forget to ask medical and veterinary librarians and information professionals. They are trained in systematic literature searching and can offer advice and support. For example, in the UK, the RCVS Knowledge Library & Information Services ☑ can run literature searches for veterinarians.

# 5.1 A database search strategy

A search strategy ensures that a database search will be systematic and comprehensive.

One of the best ways to learn the fundamentals of database searching is to look at an example of a search strategy and see if you can follow the rationale and logic. Once you can do this, it becomes easier to translate the basic principles to your own searches.

Have a look at the search strategy in the table below and work through it line by line to follow the logic. Some of the terms may be unfamiliar: Boolean operators, subject heading, free text. These will be explained in more detail in the next few pages of the course.

This example is based on a search on CAB Abstracts and can be revised for other databases, which may use different subject headings. You can build a similar search using the 'Advanced' search in PubMed or VetMed Resource.

**Table 6: In [cats with naturally occurring chronic kidney disease] does [a renal prescription diet compared to normal diet] increase the [survival time] of affected cats?**

| Search number | Search terms used | Type of search | Comments |
|---|---|---|---|
| 1 | (Cat OR cats) | Free text | A free text search will find 'cat' or 'cats' anywhere in the bibliographic record (e.g. in the title field, in the journal title, in the abstract, etc.) |
| 2 | Feline* | Free text | A truncated (*) free text search will find any words which begin with the root word 'feline' anywhere in the bibliographic record. This will find 'felines' as well as 'feline'. You should be careful when using truncation searches though, as a short word will find more search terms, some of which may not be relevant. For example, 'cat*' will find 'cat' and 'cats', but also 'cattle', 'catalysts' and 'catastrophe'. |
| 3 | Felis | Free text | A free text search will find 'felis' anywhere in the bibliographic record. |
| 4 | Cats/ | Subject heading | Searching for the subject heading 'cats' should find all bibliographic records which are about cats. Some databases allow you to 'explode' a search – this will include narrower subject headings in your search and will combine them using OR. <br><br>When searching CAB Abstracts, for example, doing an exploded search for 'cats' will also find 'kittens' and 'feral cats'. In CAB Abstracts, the operator 'exp' is used before a subject heading to show it is an exploded search (e.g. here this would be 'exp Cats/') |
| 5 | 1 OR 2 OR 3 OR 4 | Combination search using 'OR' | This search combines all the searches used above to find any records about cats, using the Boolean operator 🔗 'OR'. This is a good way of ensuring that your search is comprehensive. |
| 6 | Chronic renal adj3 (failure OR disease* OR insufficienc*) | Free text | This free text search will find 'chronic renal' within 3 words of 'failure', or any word beginning with the root word 'disease' (e.g. disease, diseased, diseases), or any word beginning with the root word 'insufficienc' (e.g. insufficiency, insufficiencies). The database will find these in any order, anywhere in the bibliographic record. <br><br>Databases use 'proximity operators' to find words within a specified number of words of each other. CAB Abstracts uses 'adjn', with 'n' being the maximum number of words apart the terms can be. |
| 7 | Chronic kidney adj3 (failure OR disease* OR insufficienc*) | Free text | This free text search will find 'chronic kidney' within 3 words of 'failure', or any word beginning with the root word 'disease' (e.g. disease, diseased, diseases), or any word beginning with the root word 'insufficienc' (e.g. insufficiency, insufficiencies). The database will find these in any order, anywhere in the bibliographic record. |
| 8 | Kidney diseases/ | Subject heading | Searching for the subject heading 'kidney diseases' should find all bibliographic records which are about kidney disease. As with 'cats', you can explode your subject heading search. |
| 9 | Renal failure/ | Subject heading | Searching for the subject heading 'renal failure' should find all bibliographic records which are about renal failure. As with 'cats', you can explode your subject heading search. If you did an exploded search for 'kidney diseases' in CAB Abstracts this would also include 'renal failure', so you wouldn't need to include this separate subject heading search. |
| 10 | 6 OR 7 OR 8 OR 9 | Combination search using 'OR' | This search combines all the searches used to find any records about chronic kidney disease, using the Boolean operator 'OR'. This is a good way of ensuring that your search is comprehensive. |
| 11 | (Renal or kidney or prescription or therapeutic) adj3 diet* | Free text | This free text search will find any of the search terms in brackets within three words of any word beginning with 'diet' (e.g. diet, diets, dietary), anywhere in the bibliographic record. |
| 12 | Renal diets/ | Subject heading | Searching for the subject heading 'renal diets' should find all bibliographic records which are about renal diets. As with 'cats', you can explode your subject heading search. |
| 13 | Therapeutic diets/ | Subject heading | Searching for the subject heading 'therapeutic diets' should find all bibliographic records which are about therapeutic diets. As with 'cats', you can explode your subject heading search. |
| 14 | 11 OR 12 OR 13 | Combination search using 'OR' | This search combines all the search terms used to find any records about diets, using the Boolean operator 'OR'. |
| 15 | 5 AND 10 AND 14 | Combination search using 'AND' | This search combines the previous combination searches, using the Boolean operator 'AND'. This will now limit results to records about renal diets in cats with chronic kidney disease. |

# 5.2 Search terms

Once you have written your question (see the **Ask** section), use the PICO or SPICO terms to help you build your search strategy.

## 🔖 Example Scenario

Here is an example using **(S)PICO** i.e. including species:

*In [cats with naturally occurring chronic kidney disease] does [a renal prescription diet compared to normal diet] increase the [survival time] of affected cats?*

## Step 1:

Make a list of the key concepts needed to build your search.

> In this example, the key concepts for the search strategy would be 'cats', 'kidney disease' and 'diets'.
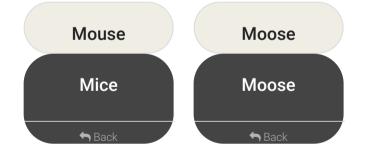>
> **Note: The (S)PICO and the Search Strategy are not the same thing!**

It is likely you will not search on all your (S)PICO terms. For example, 'Outcome' terms are often excluded from a search because they can be broad terms with many alternatives, meaning key articles may be missed if they are used. Also, outcomes may not be mentioned in the abstract, particularly if the outcome is recovery.
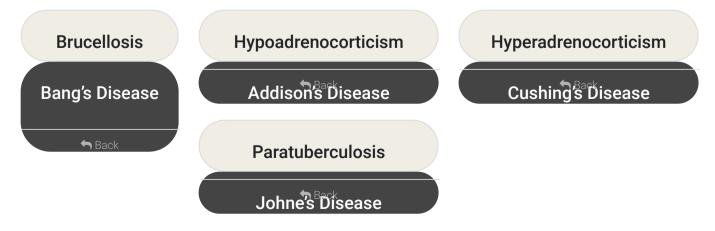
## Step 2:

Think of synonyms and alternative terms for each concept. Click the cards below to show examples of these.

### Plural terms

| Mouse | Moose |
|-------|-------|
| **Mice** | **Moose** |
| ↰ Back | ↰ Back |

### Diseases

| Brucellosis | Hypoadrenocorticism | Hyperadrenocorticism |
|-------------|---------------------|----------------------|
| **Bang's Disease** | **Addison's Disease** ↰ Back | **Cushing's Disease** ↰ Back |
| ↰ Back | | |

| Paratuberculosis |
|------------------|
| **Johne's Disease** ↰ Back |

## Young animals

| Dogs | Horses | Cats |
|------|--------|------|
| Puppies | Foals | Kittens |
| ↩ Back | ↩ Back | ↩ Back |

## English and Latin terms

| Itch | Rash |
|------|------|
| Pruritis | Exanthem |
| ↩ Back | ↩ Back |
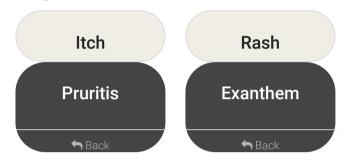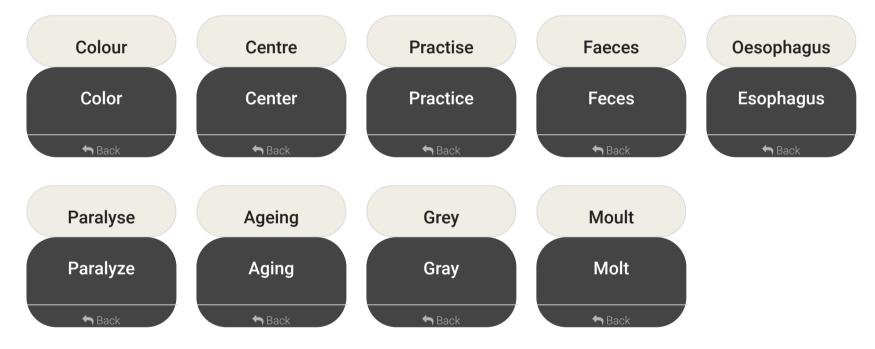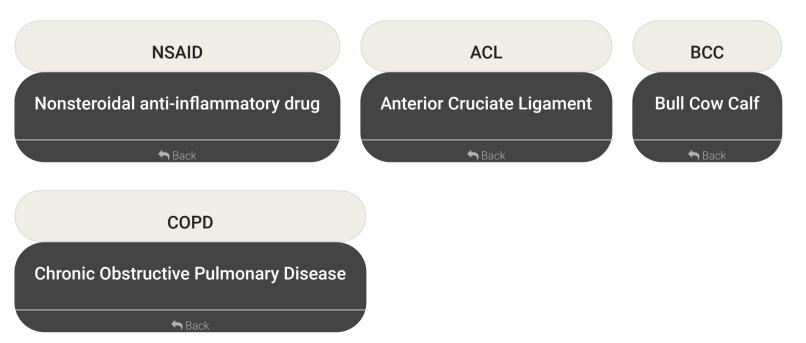
## Alternative spellings for your terms

Examples of UK English/American English spellings and usage

| Colour | Centre | Practise | Faeces | Oesophagus |
|--------|--------|----------|--------|------------|
| Color | Center | Practice | Feces | Esophagus |
| ↩ Back | ↩ Back | ↩ Back | ↩ Back | ↩ Back |

| Paralyse | Ageing | Grey | Moult |
|----------|--------|------|-------|
| Paralyze | Aging | Gray | Molt |
| ↩ Back | ↩ Back | ↩ Back | ↩ Back |

## Abbreviations and acronyms

[Veterinary Abbreviations and Acronyms from the University of Illinois Veterinary Library](#) ⧉

| NSAID | ACL | BCC |
|-------|-----|-----|
| Nonsteroidal anti-inflammatory drug | Anterior Cruciate Ligament | Bull Cow Calf |
| ↩ Back | ↩ Back | ↩ Back |

| COPD |
|------|
| Chronic Obstructive Pulmonary Disease |
| ↩ Back |

## Step 3:

Be as specific as possible, and where you are interested in a broad topic, e.g. kidney disease, list the more specific topics, e.g. types of kidney disease, that you want to cover.

## Table 7: Examples of specific topics related to kidney disease

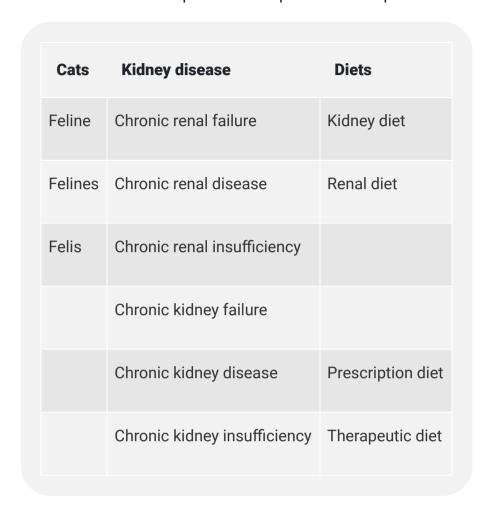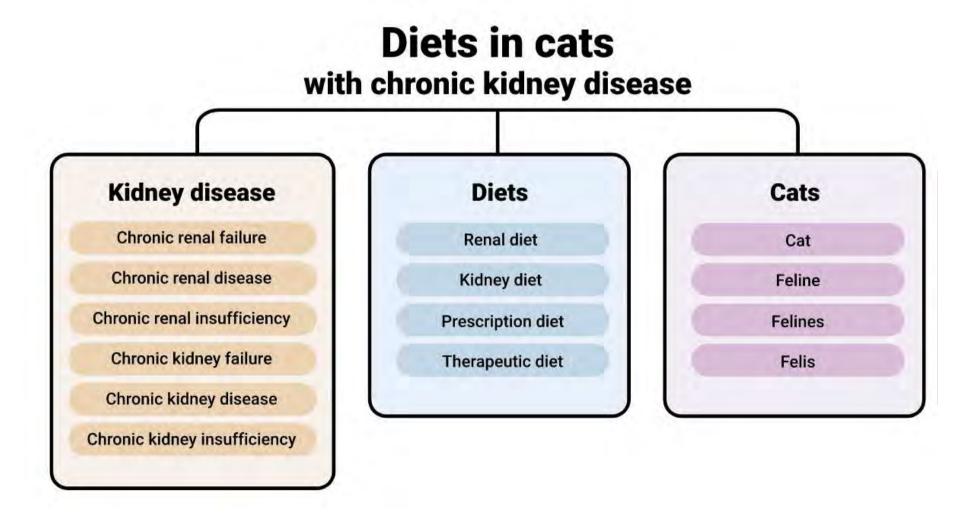| Cats | Kidney disease | Diets |
|---|---|---|
| Feline | Chronic renal failure | Kidney diet |
| Felines | Chronic renal disease | Renal diet |
| Felis | Chronic renal insufficiency | |
| | Chronic kidney failure | |
| | Chronic kidney disease | Prescription diet |
| | Chronic kidney insufficiency | Therapeutic diet |

## Figure 3: Breaking down a topic to maximise search effectiveness

This diagram shows how you might break down a topic (diets in cats with chronic kidney disease) into key concepts (diets, cats, kidney disease) and then use synonyms or related terms for each concept in your search strategy.



For example, under 'diets' you could search for renal diet, kidney diet, prescription diet and therapeutic diet. Under 'kidney disease' you could search for chronic renal failure, chronic renal disease, chronic renal insufficiency, chronic kidney failure, chronic kidney disease and chronic kidney insufficiency. Under 'cats' you could search for cat, feline, felines and felis.

This will maximise retrieval of relevant publications, as authors may use different terms to describe the same concepts.

# 5.3 Types of search

There are two types of search: free text searching and subject heading searching.

Using a combination of the two can help maximise the chances of retrieving the most relevant evidence.

## Free text search

A free text search instructs the database to find exactly what you type in the search box, regardless of the meaning.

**radius** – results related to the arm bone and results related to the geometric measure

**cat** – results related to the feline animal and results related to computed axial tomography scans

Free text may seem to be the **simplest** method but it's not necessarily the most **effective** method.

## ⚠️ Warning:

- **Include plurals**
  A search for 'dog' might not always retrieve results containing the word 'dogs'.
- **Include variant spellings**
  A search on 'animal behaviour' (the UK English spelling) might not always retrieve results containing 'animal behavior' (the American English spelling).
- **Beware of context-specific meanings**
  A search for 'membrane' means one thing to a biologist and a different thing to an engineer.

This is particularly important if you're searching a resource which isn't subject specific, such as Google Scholar.

## Subject heading search

If the database has subject headings or thesaurus terms you should take full advantage of this. It will retrieve results the database publisher has grouped together as being related. The results may contain related terms, which you may not have thought of, and this should improve the results of your search.

Subject headings are specific to each database and are variably called:

- **MeSH** (Medical Subject Headings) in PubMed and MEDLINE
- **CAB thesaurus descriptors** in CAB Abstracts

One of the most common mistakes in veterinary searches, is that the species search terms are incomplete. The search often contains a keyword term for the species, however, it does not also include the subject heading. This can result in a large number of relevant papers being missed. The critical point is that a variety of terms could accurately describe a species without describing it completely.

# Combine free text and subject heading searches

It is recommended practice to run both a free text search and a subject heading search for each of your key concepts and then to combine the two searches with the Boolean operator 'OR'. This will maximise the chances of you retrieving all the most relevant evidence for that concept because:

New records in PubMed and MEDLINE don't necessarily have subject headings added immediately.

It can take months for some records to be completed; you can only retrieve very recent articles with free text terms.

Using subject headings relies on the database producers adding the subject headings correctly.

Sometimes the databases can omit relevant subject headings.

Return to the example search strategy to see how this can be done.

# 5.4 Boolean operators

Boolean operators instruct the database or search engine on how to combine your search terms and how to search for the information requested.

The Boolean operators are AND, OR and NOT.

These search conventions are used by most search engines and search tools.

You should become familiar with using them as they can make a big difference to the relevance and number of results you get.

## Table 8: Boolean operators

| | | |
|---|---|---|
| cats AND dogs  | AND | 'AND' retrieves only the records containing *all* the combined terms: this example has retrieved records about both cats *and* dogs. |
| cats OR dogs  | OR | 'OR' retrieves only the records containing *any* of the combined terms: this example has retrieved records about *either* cats *or* dogs, or *both*. |
| cats NOT dogs  | NOT | 'NOT' retrieves records containing one term but *excludes* records containing an unwanted term: this example has retrieved records about cats but has *excluded* everything about dogs.<br>WARNING: Use 'NOT' with caution, as it can *exclude* records which may be useful. For example, if a paper is about cats, but *mentions* dogs (e.g. "dogs were present in the household") then the use of 'NOT' will lose those papers. |
| Kidney disease AND (cats OR dogs)  | AND & OR | Use more than one Boolean operator to make more complex refinements: this example has retrieved records about kidney disease and either cats or dogs. |

# Nesting

Most databases are programmed to give 'AND' precedence over 'OR' in a search, but you can override this by putting terms in parentheses. This enables you to specify the order in which the terms should be searched. Terms within parentheses will be found first, and then combined with terms outside them. This technique, called nesting, is commonly applied when you have multiple search terms for the same concept.

Here is an example:

(cats OR dogs OR felines OR canines) AND Kidney disease

**Different databases follow different rules**

**...Check the help files for the database and platform you are searching!**

**PubMed performs Boolean operations from left to right unless brackets are used.**

**PubMed inserts AND between terms if you do not add your own Boolean operator.**

## 5.5 Search tips

When searching bibliographic databases, it's important to remember that the database will only search for what you tell it to search for.

If you're looking for resources on different types of livestock and use the search term 'livestock', the database won't know that you're interested in searching for cattle, sheep, goats, and poultry, unless you use those as search terms.

**Be specific in your searches.**

It is good practice to search for each concept separately. Having done this and perused the results allows verification that the terms retrieve relevant results for each concept. Then combine the individual concepts into a single result representing your (S)PICO . In most databases this is accomplished by using the Advanced search function or the Search History. These allow you to see the previous searches and results and to combine, recombine and edit them.

This has the advantage of enabling you to see the number of search results each concept gets.

That might help you to refine your search terms!

Boolean operators allow you to build your search up term by term...

...and then combine these terms in a variety of different ways, depending on how useful the results are.

## Useful features you can use when searching

*Truncation* – This usually uses the symbol asterisk * at the end of a search term. This allows you to search for all possible endings, e.g. therap* will find therapy, therapies, therapeutic, etc.; diet* will find diet, diets, dietary, etc.

*Proximity searching using ADJn, NEAR/n, NEXT* – These work best when searching closely related words that you would expect in a paragraph, e.g. therap* NEAR diet*

*Wildcards* – This usually uses the question mark symbol ? to replace a letter within a word, e.g. an?esthesia will retrieve anaesthesia and anesthesia.

The symbols and functions for wildcards and truncation vary between different databases and search tools.

Check the help pages for each database to see what they support and use before starting your search.

For instance, Google doesn't support truncation with an asterisk; instead it truncates automatically using stemming algorithms. However, asterisks can be used in Google as wildcards.

You can use these features to ensure that searches are comprehensive.

For example, when searching for information on cattle, a comprehensive search could be:

(cow OR cows OR cattle OR calf OR calves OR bovin* OR bovid* OR steer OR steers OR freemartin)

# 5.6 Limits and filters

You can apply limits and filters to ensure that you have fewer irrelevant results to look through. Most databases offer the ability to refine your search results using different parameters:

**✖ Publication date**                                                              Click to close

The most commonly used limit is publication date – you can limit your search results to articles published in a particular year range. However, it is important to remember that older papers may still be valid and relevant.

**✖ Geographical area**                                                             Click to close

Some databases allow you to limit by geographical area (for databases which use subject headings, there are usually geographical subject headings which you may wish to use). However, bear in mind that you may exclude some relevant articles when you limit by geographical area.

**✖ Language**                                                                       Click to close

Most databases allow you to limit your results to publications in specified languages. In systematic reviews it would not be acceptable to apply language limits, as here you would need to report all the publications retrieved regardless of the language, so that others who might speak the languages could potentially appraise the evidence available.

**✖ Publication type**                                                              Click to expand

In some databases you can also restrict to certain publication types or study types such as journal article, conference paper, randomised controlled trial, meta-analysis or review, though this is not always reliable.

**✖ Search filters**                                                                 Click to close

Some databases allow you to apply search filters (also called methodology filters) to your search. Search filters are pre-created search strategies which can be used to retrieve particular types of study, such as systematic reviews or meta-analyses. You can use the help pages of the different databases to find out which filters are available in that database. For example, the publishers of CAB Abstracts have produced a search filter to retrieve systematic reviews or meta-analyses in CAB Abstracts and Global Health called CABI filters ☐ (pdf).

# 5.7 Refining your search

**Searching databases is an iterative process.**

As you review your results, you may decide to refine your search strategy to include, exclude or amend some search terms, limits and/or filters. This is a normal and necessary part of the literature searching process.

**Here's some advice to help you address the most common search problems.**

Firstly, if you already know of key papers in your field, check that they have been found by your search. If they have not, consider revising your search strategy until they are found.

## If you have too many hits: narrow your search

**If a carefully conducted search yields lots of results, this suggests your area of interest is complex and researched widely.**

**✖ Be specific**     Click to close

Use search terms that are as precise as possible.

**✖ Boolean operators**     Click to close

Use the powerful 'AND' operator to refine your search by adding extra search topics.

**✖ Limits**     Click to close

Reduce the parameters of your search by selecting publication year, language, publication type, etc. There is a **full range of limits**, but use some with caution, for example, restricting your search to articles in English is an arbitrary measure, probably excluding excellent research.

**✖ Focus**     Click to close

Some databases have a 'major heading' option for subject heading terms, restricting the search to articles with your term as a main subject. Again, use this with caution as you may miss some excellent articles.

**✖ Subheadings**     Click to close

Some databases have subheadings, e.g. drug therapy, surgery and aetiology in MEDLINE. These allow you to qualify subject headings to limit them to specified facets of research. Be cautious with subheadings – they are not always consistently applied, and you may miss relevant articles.

**✖ Search filters/methodology filters**     Click to expand

Apply 'ready-made' **search filters** to find the right data. Some databases have them as Limits, or you can use methodological filters for systematic reviews, meta-analyses, etc. Validated search filters, e.g. for different study types such as RCTs and systematic reviews, are available on the **InterTASC website** ☐.

# If you have too many irrelevant hits

**✖ Subject headings**                                                     Click to close

You will retrieve a higher proportion of relevant articles if you search with subject headings rather than with free text alternatives. But this does risk missing new articles that have not yet been given subject headings, e.g. in MEDLINE and PubMed.

**✖ Thesaurus display**                                                    Click to close

Use the subject tree/index to find more precise subject headings.

**✖ Limits**                                                               Click to close

See above.

**✖ Avoid using the Boolean operator 'NOT'**                               Click to close

It can mean you miss relevant results.

# If you would like more hits: broaden your search

**✖ Check your spelling**                                                  Click to expand

It may seem obvious, but incorrect spelling, particularly in free text searching, will reduce the number of results. It's easy to spell cattle with three 't's, for example! Beware of alternative spellings during textword/keyword searches (e.g. behaviour/behavior; immunisation/immunization).

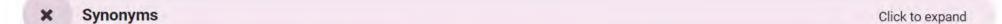**✖ Explode**                                                              Click to expand

Subject headings are hierarchical; a broad term has narrower terms under it. This may seem an odd term, but choosing a search heading and searching it and all the narrower terms is called exploding the subject heading. Subject headings are often described with the visualisation of a tree with branches. The broad terms are the large branches and the narrower terms are smaller branches from it. An example of this is PubMed's MeSH subject headings, the **MeSH Tree.** 🔗

**✖ Avoid subheadings**                                                    Click to expand

Select 'All subheadings' when you are presented with the option, because the subheading system is not entirely reliable.

**✖ Synonyms**                                    Click to expand

Most database content is international, so if your search terms do not map to any appropriate subject headings, think of North American or other equivalents.

**✖ Lateral searching**                           Click to expand

Look at the subject headings tagged onto a relevant article. Use those terms to expand the scope of your search.

**✖ Free text searching**                         Click to expand

Make sure you are using free text (or keyword) searches as well as subject heading searches, as some concepts will not be captured by subject headings, but will appear in the title and abstracts of publications.

**✖ Related terms**                               Click to expand

Use the truncation symbol (the symbol can vary between databases, but the most common one is *) in your textword/keyword search to retrieve words with a common root. 'Tubercul*' will bring up tuberculosis, tuberculin, tubercule, etc.

**✖ Search other databases too**                  Click to expand

No database is complete. In addition to CAB Abstracts and MEDLINE or PubMed, try the Biosis Citation Index, Web of Science, etc.

**✖ Avoid limits**                                Click to expand

Especially ones that don't influence the quality or relevance of search results (for example, 'abstract only').

# 5.8 Citation searching

> **Citation searching is a powerful method for finding publications relating to your field of research, which might not be found using conventional search strategies.**

This type of search is often done in addition to standard database searching, to increase the recall of all the relevant literature.

Find one relevant publication and you can locate others by 'time travelling':

## Go back in time

Explore the list of references at the end of the publication to explore the literature that informed the author(s).

## Go forward in time

Explore newer publications that 'cite' the publication (see How to do citation searches ↓ below).

> The metaphor 'citation pearl growing' describes citation searching, as it's like seeing a single grain of sand (your one useful publication) grow into a beautiful pearl (a list of many useful references).

> ## ⚠ Warning:
> This method should not be used in isolation when searching for evidence as large amounts of information could be missed.

## Where to do citation searches

Certain subscription databases have a citation index created from the lists of references that appear at the end of journal articles. This means you can also find articles that cite that journal article, as well as the articles which that article references.

- Web of Science ⤤ from Thomson Reuters – includes the three original citation indexes, including the Science Citation Index)
- Scopus ⤤ (from Elsevier – the main competitor to Web of Science)

A freely available option is:

- Google Scholar Citations ⤤

Google Scholar offers citation information in the search results.

The results of Google Scholar may not tally with those of the formal, bibliographic databases, since they have different coverage: Google Scholar citations are found online so may include pre-prints, conferences, non-indexed publications and non-reviewed websites; by contrast, Web of Science and Scopus citations are curated from a specific list of publications.

## How to do citation searches

Step 1. Choose a key publication that is highly relevant to your search

> **A brand-new publication usually doesn't work as well because researchers need time to find the publication you are searching for citations of, read it, write something of their own that includes your article in the references, and publish their piece.**

Step 2. In one of the tools listed in 'Where to do citation searches', conduct a search for your article (for example, an author/title search or use 'Cited Reference Search').

Step 3. The citations relating to your article will be accessible via links called variably 'Citation network', 'Cited By', or 'Related Articles'.

**✖**     **Advantages of citation searching**      Click to expand

- You can follow a line of scholarly communication on a given topic over time.

- You can find publications that were not found via standard database searches.

- You are not constrained by the vocabulary of a search strategy or bibliographic record. You may also find articles from unexpected disciplines.

- You can go backward and forward from a 'seed' reference.

- You can gauge the 'impact' of a publication by looking at the citation count; articles that are frequently cited have had greater impact or influence in the scientific community (though of course there will be exceptions to this, for example, papers which are disputed can be heavily cited, so you still need to appraise the paper yourself).

# 6. How do I manage my search results?

To minimise bias, the process of scanning the results of a database search should include pre-defined inclusion and exclusion criteria.

Scanning your results generally goes as follows:

- **Title sift** – scanning all the titles your search finds to see if they are relevant to your question (and discard those that are not).
- **Abstract sift** – reading through the abstracts from your title sift to see if they are relevant to your question.
- **Full-text sift** – reading through the full manuscripts from your abstract sift to see if they are relevant to your question.
- **Studies** included in your review.

    Following this process, you can identify the studies relevant to your (S)PICO to include in your review.

**TIP**: Remember to save your search strategy as you go along, so that you can re-run the search at a future point if necessary.

In the next section Appraise you will find out more about how to assess the relevance of your evidence, including the levels of evidence and identifying the best study designs to help to answer your (S)PICO

# 6.1 Additional reading: Not enough evidence?

**It is not unusual for a veterinary (S)PICO search to retrieve no evidence, but there are a number of constructive things you can do if this happens.**

If your database searching finds zero publications, consider why this might be and what you can do next.

There are four main reasons why you might get zero hits.

## 1. The evidence doesn't exist

The body of veterinary literature is relatively small compared with that for human medicine, so it may be that there is just no published evidence out there that answers your question.

If you find that there is no evidence, report and publish this.

- It helps identify gaps in the evidence base
- It helps focus new research funding and effort where it's needed
- It prevents duplicated effort (i.e. saves someone else wasting time repeating the search)

---

**You will find many examples of evidence syntheses that report zero hits – this is not a sign of failure!**

For example:

- [Are antibiotics useful in treating acute pancreatitis in dogs?](#) ↗
- [Conservative treatment for cattle DA - does Buscopan make a difference?](#) ↗
- [Antibiotics in cat bite abscesses](#) ↗

---

While it may be tempting to refine our question in light of zero hits, or abandon publishing an evidence summary, we should guard against bias and openly report areas where evidence is lacking.

Just because there is no published evidence for treatments does not mean they do not work. When literature searches reveal gaps in available evidence this can be seen as an opportunity to identify new areas for publishing research, but can also be a reminder that formally published studies are only one part of EBVM, with the preferences of patients/owners and the knowledge and experience of vets also key factors in decision-making.

## 2. The evidence exists, but can't be found via bibliographic databases

Remember, the bibliographic databases generally only list formal publications, and will not always retrieve grey literature or evidence that has not been published.

For vets this is a particular issue, as much evidence may be tucked away in practice clinical records, rather than scientific publications.

Vets need to be open to using other sources/methods for finding published evidence:

- Grey literature/unpublished data/online sources
- Case records we may have access to locally
- Using social media/social networks to locate others who know of relevant evidence

## 3. The evidence does exist in the databases, but we're not finding it

It might be that our search strategy is not effective for retrieving evidence from the databases. Things to consider:

- Get your search strategy checked by a colleague or librarian, to see if it has errors in it or if it can be improved.

- Avoid 'over-specification' where your query is too narrow and so yields few or no results. Consider dropping an element of your (S)PICO from the database search:

  - **SPECIES** – do you really need to include this in your search?

  - **PROBLEM** – are there broader terms you could use?

  - **INTERVENTION** – there won't always be studies that directly compare your intervention with your comparison, so try searching on just one of them

  - **OUTCOME** – rarely included in veterinary searches, as the outcome terms are often very broad, with many synonyms, so can cause you to miss relevant results.

- Try to improve your database search skills with training.


## 4. The evidence exists but you can't get access to it

Refer to the earlier advice on accessing evidence.

## 6.2 Sharing a search for publication

**Publishing and sharing our evidence syntheses can benefit the whole veterinary community.**

If you intend to publish your search it is good practice to report the search strategies so that they are transparent and reproducible.

Reporting your search in a standard way enables the search to be replicated in the future, to identify any new evidence published since the last search was run. It also demonstrates the quality of the search strategy and allows others to assess this – they will want to have confidence that the search captured the most relevant literature.

As a minimum, the following should be reported:

### The search strategy

- **The names of the databases** (including the platform and database coverage dates)
- **The search strategies** (for example, the full search terms used, with an explanation of any decisions made about these if not self-explanatory, plus the way the terms were combined with Boolean operators)
- **Any limits or filters applied to the search** (for example, date, language)
- **The date on which the search was conducted**
- **Names of any other sources searched/details of any supplementary searching**

### The search outcome

- **The number of publications** that were found in the searches and how many were included in the synthesis
- **The inclusion and exclusion criteria** used to screen results (for example, duplicates, languages, dates, types of study)

If you plan to publish an evidence synthesis, then the target publisher may have reporting standards that you need to follow. For examples, see:

[Guidance on compiling a Knowledge Summary](#) ⬈ from RCVS Knowledge, which includes a [Knowledge Summary Template](#) ⬈ with a requirement for reporting the Search Strategy and the Search Outcome.

[Reporting a literature search for BestBETs for Vets](#) ⬈

### Reporting guidelines for systematic reviews and meta-analyses

It is important to follow the guidelines for reporting studies, including systematic reviews and meta-analyses.

Comprehensive guidelines for transparent and comprehensive reporting of systematic reviews and meta-analyses, including a flowchart, are provided on the [PRISMA](#) ⬈ (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) website.

[SYREAF](#) ⬈ provides resources related to systematic reviews for animals and food.

[Meridian](#) ⬈ gathers together the reporting guidelines for studies that involve animals.

# 6.3 Reference management tools

> **You will find references which you may want to use later or plan to cite.**
>
> Reference management tools, or bibliographic management tools, allow you to store and organise your references.

There are several reference management tools available. The University of Edinburgh has produced a [comparison table ⬚](#) (pdf), which gives information on some of the reference management tools you may wish to consider.

## Free

- [Zotero ⬚](#) – open source
- [Mendeley ⬚](#) – owned by Elsevier
- [EndNote Online ⬚](#) – owned by Clarivate Analytics

## Subscription required

- [EndNote ⬚](#) – owned by Clarivate Analytics
- [RefWorks ⬚](#) – owned by ProQuest

You can create collections of references on different topics, different conditions, different treatment outcomes and so on, and you can add your own notes to each bibliographic record. As these tools are electronic, they can be searched easily, allowing you to retrieve your key references on a topic quickly.

Many reference management tools allow you to add attachments to the records. For example, you may wish to add your own clinical images, web pages, PDFs or links to full-text articles. You can manually add records from a bibliographic database to reference management tools, but it's more common to electronically export a set of records into whichever reference management tool you're using. Most databases support this and have an 'export' option.

> **When you're exporting records from a bibliographic database to a reference management tool, it's a good idea to export the whole record. You can always delete some of the fields later, but you may find that you want to retain things, such as the subject headings and the abstract, as these include information which you can search later.**

Most reference management tools have plug-ins which work with Microsoft Word and other word processing packages, allowing you to embed your references into a document. You can also re-order and change referencing styles for references in documents, either as you write or after you have completed a document. Reference management tools usually support a wide range of referencing styles, and many list them by journal title as well as by citation style.
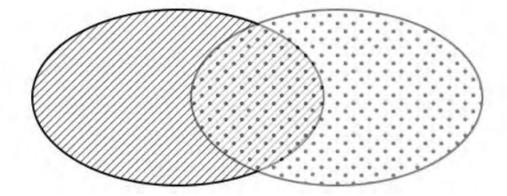
> Most web-based reference management tools allow you to create groups of records and share them with other people, so if you are working on a clinical project, you can easily share references with colleagues.

# 7. Quiz

1. RCVS Knowledge publishes evidence summaries. What are they called?

○ RCVS Shorts

Incorrect. Nice try!

○ BestBETS for Vets

Incorrect. BestBETS for Vets are evidence summaries produced by the Centre for Evidence-based Veterinary Medicine at Nottingham University.

○ CATS

Incorrect. In human medicine, CATS stands for Critically Appraised Topics, a type of evidence summary, but in the vet community it was felt it could be confused with the feline species!

○ Knowledge Summaries

Correct. RCVS Knowledge in the UK is creating a global network of vets to collaborate and create an open source repository of Knowledge Summaries to support EBVM.

○ Systematic reviews

Incorrect. This is a type of evidence synthesis (or secondary literature) that identifies, appraises, and synthesises all the available published evidence about a specific question and arrives at an answer.

Check answer     Show answers and explanations

2. What bibliographic databases have been shown to have the greatest percentage coverage of journals with veterinary content? Select all that apply.

☐ MEDLINE

Incorrect. This is a key database for the biomedical sciences and human medicine. It covers many of the key peer-reviewed veterinary journals and has a focus on inter-disciplinary journals in health sciences.

☐ CAB Abstracts

Correct. CAB Abstracts is available by subscription under several names and models. Under the name CAB Abstracts it is sold to institutions. Individual veterinarians or practices can take out a subscriptions to the related product, VetMed Resource, which contains the veterinary related records from CAB Abstracts. Additionally, access to VetMed Resource may be a benefit with membership to an association or library, examples include the BSAVA and the RCVS Library.

☐ VetMed Resource

Correct. VetMed Resource contains veterinary related records that are a subset of CAB Abstracts. CAB Abstracts is available by subscription under several names and models. Under the name CAB Abstracts it is sold to institutions. Individual veterinarians or practices can take out a subscriptions to the related product, VetMed Resource, which contains the veterinary related records from CAB Abstracts. Additionally, access to VetMed Resource may be a benefit with membership to an association or library, examples include the BSAVA and the RCVS Library.

☐ PubMed

Incorrect. PubMed is a free version of MEDLINE, a key database for the biomedical sciences and human medicine, though it also covers many of the key peer-reviewed veterinary journals and has a focus on inter-disciplinary journals in health sciences.

☐ BIOSIS Citation Index

Incorrect. This is the key database for biological sciences, and so while it may give some useful results, it would not be the key database for clinical veterinary practice.

Check answer     Show answers and explanations

3. What does the VetSRev database help you to find?

○ Grey literature

Incorrect. Grey literature is material that is not commercially published. Examples are government reports, white papers, and conference papers.

○ Vets who are vicars

Incorrect. Nice try!

○ Systematic reviews

Correct. VetSRev is a freely accessible online database of citations of systematic reviews relevant to veterinary medicine, produced by the Centre for Evidence-based Veterinary Medicine at Nottingham University.

○ Peer-reviewed articles

Incorrect. The Bibliographic databases such as CAB Abstracts, PubMed, and MEDLINE would do this.

○ Knowledge Summaries

Incorrect. Knowledge Summaries is the term used by RCVS Knowledge to describe evidence summaries, not systematic reviews.

**Check answer**     **Show answers and explanations**

4. Which of these Boolean searches would recall the most results for this species?

○ cattle NOT bovine

Incorrect. NOT excludes records containing an unwanted term, so here only results containing the term cattle would be retrieved.

○ cattle AND bovi*

Incorrect. AND should be used to combine different concepts as it retrieves only records containing both terms.

○ cattle AND bovine

Incorrect. AND should be used to combine different concepts as it retrieves only records containing both terms.

○ cattle OR bovine

Incorrect. OR does retrieve records containing any of the combined terms but adding truncation to one of the terms here would give you more results.

○ cattle OR bovi*

Correct. OR retrieves records containing any of the terms and so should be used to combine synonyms, and by using the asterix to truncate bovi* you retrieve words with all possible endings such as bovid, bovine and bovidae.

**Check answer**     **Show answers and explanations**

5. For the image above, which Boolean operator would you use to retrieve only the results that are both striped and spotted?

○ AND

Correct. Using 'AND' will only give you the results that appear in both searches. AND narrows a search, to be more specific. Using 'NOT' will eliminate either the spotted or the striped results. Using 'OR' will give you striped or spotted results - OR widens a search strategy.
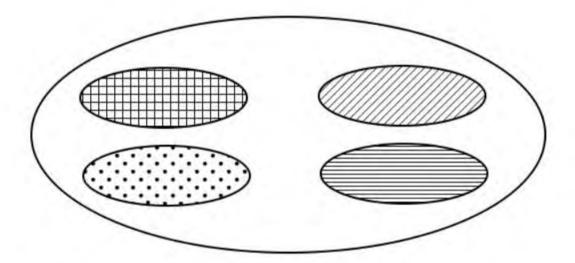
○ NOT

Incorrect - NOT will eliminate either the spotted or the striped results.

○ OR

Incorrect - OR would give you striped or spotted results. OR widens a search strategy.

Check answer     Show answers and explanations



6. For the image above, which Boolean operator would you use to retrieve results from all four searches?

○ AND

Incorrect. AND narrows a search to be more specific.

○ NOT
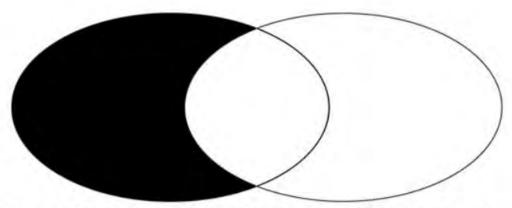
Incorrect. NOT narrows search results.

○ OR

Correct. OR broadens a search. NOT and AND both narrow search results.

Check answer     Show answers and explanations

7. For the image above, which Boolean operator would you use to retrieve ONLY the black search results?

○ AND

Incorrect. Using AND would retrieve results that are both black AND white.

○ NOT

Correct. Searching for black NOT white excludes white results and excludes results that are white and black - so that you retrieve results that are only black. NOT eliminates search results. Using OR would give you results that are black or white - OR broadens a search. Using AND would retrieve results that are both black and white.

○ OR

Incorrect. Using OR would give you results that are black or white - OR broadens a search.

Check answer    Show answers and explanations

# 8. Summary

## Learning outcomes

You should now be more familiar with how to:

- identify the best sources of veterinary evidence

- establish which sources you have access to

- search for evidence

- manage your search results.

Now that you have the evidence you need to use it to answer your clinical question.

**Now move onto the Appraise section** →

# 9. References

## Recommended reading

Booth, A., Papaioannou, D. and Sutton, A. (2012) *Systematic approaches to a successful literature review*. London: Sage

De Brun, C. and Pearce-Smith, N. (2014) Searching skills toolkit: finding the evidence. 2nd ed. Oxford: Wiley Blackwell

*EBVM Toolkit 2: finding the best available evidence* [RCVS Knowledge] [online] Available from: http://knowledge.rcvs.org.uk/document-library/ebvm-toolkit-2-finding-the-best-available-evidence/ ⧉ [Accessed 31 July 2020]

Greenhalgh, T. (2019) *How to read a paper: the basics of evidence-based medicine and healthcare.* 6th ed. Oxford: Wiley Blackwell

Levay, P. and Craven, J. (eds.) (2019) *Systematic searching. Practical ideas for improving results*. London: Facet Publishing

## Other useful references

Brodbelt, D. (2014) Practice data: building the evidence base: six different presenters provide a fascinating insight into the strengths and limitations of data from pr*actic e*. In: *Proceedings of the 1st International EBVM Network Conference, 23–24 October 2014, Windsor, UK.* London: RCVS Knowledge

Doig, G. S. (2003) Evidence-based veterinary medicine: what it is, what it isn't and how to do it. *Australian Veterinary Journa*l, 81 (7), pp. 412–415

Fletcher, D.J. et al. (2012) RECOVER evidence and knowledge gap analysis on veterinary CPR. Part 7: clinical guidelines. *Journal of Veterinary Emergency and Critical Care*, 22 (s1) S102-S131. Available from: https://doi.org/10.1111/j.1476-4431.2012.00757.x ⧉

Gibbons, P. M. and Mayer, J. (2009) Evidence in exotic animal practice: a "how-to guide". *Journal of Exotic Pet Medicine*, 18 (3), pp. 174–180

Glanville, J. et al. (2015) *Technical manual for performing electronic literature searches in food and feed safety.* EFSA

Grindlay, D. J. C., Brennan, M. L. and Dean, R. S. (2012) Searching the veterinary literature: a comparison of the coverage of veterinary journals by nine bibliographic databases. *Journal of Veterinary Medical Education*, 39 (4), pp. 404–412

Higgins, J.P.T et al. (eds.) (2019) Cochrane handbook for systematic reviews of interventions. Ver. 6.0.  Available from https://training.cochrane.org/handbook/current ⧉ [Accessed 31 July 2020]

Institute of Medicine (USA) Committee on Standards for Systematic Reviews of Comparative Effectiveness Research; Eden, J. et al. (eds.) (2011) *Finding what works in health care: standards for systematic reviews*. Washington: The National Academies Press.

Kastelic, J. P. (2006) Critical evaluation of scientific articles and other sources of information: an introduction to evidence-based veterinary medicine. *Theriogenology*, 66 (3), pp. 534–542

Knottenbelt, C.M. (2018) Do Palliative Steroids Prolong Survival in Dogs With Multicentric Lymphoma? *Veterinary Evidence,* 3 (1). Available from: https://doi.org/10.18849/VE.V3I1.96 ⧉

Moher, D. et al. (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ* 2009;339:b2535. Available from: http://dx.doi.org/10.1136/bmj.b2535 ⧉

Murphy, S.A. (2007) Searching for veterinary evidence: strategies and resources for locating clinical research. *Veterinary Clinics of North America: Small Animal Practice*, 37 (3), pp. 433–445

Nolen-Walston, R., Paxson, J. and Ramey, D.W. (2007) Evidence-based gastrointestinal medicine in horses: it's not about your gut instincts. *Veterinary Clinics of North America: Equine Practice*, 23 (2), pp. 243–266

Olivry, T. et al. (2015) Treatment of canine atopic dermatitis: 2015 updated guidelines from the International Committee on Allergic Diseases of Animals (ICADA). *BMC Veterinary Research*, 11 No 210. Available from: https://doi.org/10.1186/s12917-015-0514-6 ⧉

Orlowitz, J. (2017) You're a researcher without a library: what do you do? *A Wikipedia Librarian* [online] 15 November 2017. Available from: https://medium.com/a-wikipedia-librarian/youre-a-researcher-without-a-library-what-do-you-do-6811a30373cd ⧉ [Accessed 31 July 2020]

Place, E. and Brown, F. (2016) Literature searching for evidence-based veterinary medicine: coping with zero hits. *Veterinary Evidence*, 1 (4). Available from: https://doi.org/10.18849/VE.V1I4.77 ⧉

*Practice Guidelines* [AGREE] [online] Available from: https://www.agreetrust.org/practice-guidelines/ ⧉ [Accessed 31 July 2020]

Whiting, P. et al (2016) *ROBIS: Tool to assess risk of bias in systematic reviews.* [online] Available from: https://www.bristol.ac.uk/population-health-sciences/projects/robis/ ⧉ [Accessed 31 July 2020]

Youngen, G. K. (2011) Multidisciplinary journal usage in veterinary medicine: identifying the complementary core. *Science & Technology Libraries*, 30 (2), pp. 194–201

**Now move onto the Appraise section** →

# Appraise

# Table of contents

# 1. Introduction



**Appraising is the next step in the EBVM cycle, where you evaluate the quality of the study you are reading and its relevance to the question you have asked (or want to answer).**

## By the end of this section you will be able to:

- describe the most important factors that should be appraised when you read a paper

- explain how to appraise literature

- use tools that support the appraisal process.

# 2. Why appraise?

**Scientific literature is extremely important, but not always entirely valid.**

You may have heard the common phrase 'Buyer, beware!', but do we think this way about veterinary information? We should, particularly when it comes to the literature used to make evidence-based decisions about our patients.

Some projects assessing the quality of published literature in different fields of veterinary medicine have revealed substantial deficits in reported studies, even those in reputable peer-reviewed journals (Cockcroft, 2007; Kastelic, 2006; Simoneit et al., 2011).

You should keep this in mind when reading a paper, because you may find that conclusions formulated by authors are based on scientifically weak, if not invalid, data. Other papers may report information generated using inappropriate study designs (see Determine the level of evidence later in this section) which therefore result in questionable conclusions.



*Don't believe everything you read!*

Questions to ponder:

What is the actual quality of the paper I am reading? Is it good enough to be able to incorporate the information into my clinical work?

Papers differ considerably, in both the relevance of information to real, practical scenarios, and the validity of presented data or results (Glasziou et al. 1998, Dean 2013). Even studies published in prestigious journals may have elements of bias, or be unreliable because of flaws in the design or conduct of the study. Study limitations are often described as part of the discussion section of a paper to aid interpretation of results, but this is not always the case. These same limitations apply to other information obtained, for example, via expert presentations, drug company leaflets, internet sources, etc. When appraising other information sources, it is important to be equally critical. Consider the origin of the information: who wrote it, and why?

Every practitioner aims to provide the best patient care, with the awareness of the importance of using diagnostic procedures and therapeutic interventions that are the most effective and that have an optimal risk:benefit ratio. In addition, as a practitioner, of course you want to be able to provide an owner with accurate information regarding the prognosis for their animal, and to take into consideration established risk factors for certain conditions in your diagnostic work-up.

In order to help you do these things in the best way possible using EBVM, this section will highlight the skills needed to appraise the quality of information available.

# 3. How to appraise

As a starting point, here are some tips about reading a paper. This provides a useful 'checklist' to review your current approach or to help you get started e.g. when establishing or joining a practice journal club.

# 3.1 How to read a paper

> **The abstract and the title of the paper should provide you with an indication of what the paper is about. However, this is not always the case and they do not always reflect the content of the paper.**

Most papers which you will be reading in the veterinary literature are based on the IMRaD method of reporting: Introduction, Methods, Results and Discussion.

## Introduction

The introduction provides a brief review of the existing literature and explains why the author thinks their research is important.

The research question, or the aim of the research, should be clearly stated within the last paragraph.

**How does this help me appraise?**

**You can assess whether the study answers the question which the author set out to answer, or whether the author answers something else entirely!**

## Methods

The methods section describes the study design and how the study was carried out, providing sufficient detail that the study could be repeated. This is the most important section to focus on during your appraisal. Ensure that the outcomes being measured are clinically useful to you in your practice and if they are not, do not be afraid to discard the paper.

**How does this help me appraise?**

**You can decide if the study design is appropriate to the research question.**

**You can work through an appraisal toolkit to identify aspects of the study design. For example, was the study cohort representative of a defined population?**

## Results

The results section is a clearly presented and concise description of the key results found in the study. There should not be any author opinions or interpretation; it should be completely unbiased.

**How does this help me appraise?**

**You can work through an appraisal toolkit to identify how the study was carried out. For example, you should find a description of what happened to any animals removed from the study and why.**

## Discussion

The author(s) review the study findings, considering the existing literature and write an account of what they think the results mean. Limitations of the study design should be included here.

**How does this help me to appraise?**

**Consider the authors' views but remember you should form your own opinion on the study outcomes based on the introduction, methods and results.**

For more information about reading scientific papers, here are some other useful resources:

- Dean, R. (2013) How to read a paper and appraise the evidence. *In Practice*, 35 (5), pp. 282–285

- Greenhalgh, T. (2019) How to read a paper: the basics of evidence-based medicine and healthcare. 6th Ed. Hoboken, NJ: John Wiley & Sons

- Equator network: Guidance on scientific writing: https://www.equator-network.org/library/guidance-on-scientific-writing/ ↗

- A list of resources produced through the *British Medical Journal* explaining how to read and interpret different kinds of papers: https://www.bmj.com/about-bmj/resources-readers/publications/how-read-paper ↗

# 3.2 Which papers will answer your clinical question?

> **Why am I reading this paper? Is it relevant to the clinical question I am interested in?**

> **Think back to Ask, where you structured your clinical question as a PICO, or (S)PICO. Using a (S)PICO helps you to decide whether a paper is relevant to your clinical question.**

Here is an example using (S)PICO i.e. including species:

> **In [cats with naturally occurring chronic kidney disease] does [a renal prescription diet compared to normal diet] increase the [survival time] of affected cats?**

The literature that you need to read in order to answer your clinical question should relate to cats, kidney disease and diets.

The research question being addressed by the paper is usually found in the last paragraph of the introduction.

# 3.3 The three steps of appraisal

Once you have decided that a paper will potentially answer your clinical question, there are three steps used to evaluate whether it will provide useful evidence.

Step 1: Determine the level of evidence within the paper

Step 2: Appraise the quality of the study

Step 3: Your conclusion – Is the paper of sufficient quality?

With a little practice this shouldn't take long and will ensure that the information you gain from reading and appraising scientific literature is of sufficient quality to Apply in your clinical practice.

**TIP:** Read through the sections below and then try working through the steps with a sample study and a blank criteria checklist (see Critical appraisal and appraisal toolkits later in this section). Challenge a colleague to do the same and compare your findings.

**And remember – practice makes perfect!**

# 4. Step 1: Determine the level of evidence

There are two aspects that you need to consider in order to determine the level of evidence of your paper.

- What is the study type (or design)?
- Is the study design appropriate to answer my clinical question?

We will go through each of these aspects in turn.

# 4.1 What is the study type (or design)?

> **When reading a paper, it is important to determine what type of study was conducted so that you can establish whether the study type is appropriate to help answer your question.**

This is important because different study types are more (or less) appropriate to answer different question types. This will be covered in more detail later on, in Is the study design appropriate to answer your question?

In order to decide on the study type, you will need to look at the methods section of the paper. The author may state which study type is used, but sometimes careful reading may contradict this.

A brief description of the common study types is outlined under 'Study types and descriptions' below (adapted from Dean, 2013). There is also information on identifying study types in the RCVS Knowledge EBVM Toolkit 4 – What type of study is it? ⤤.

## Study types and descriptions

Adapted from Dean (2013)

## Evidence syntheses: Studies that summarise evidence

### ✖ Systematic review
Click to close

A systematic review is a defined and rigorous method of appraising, collating and summarising the information from published papers addressing a specific question. The methods used to search the literature, assess the quality, and make conclusions are explicitly stated in the methods section.

### ✖ Meta-analysis
Click to close

A meta-analysis is a quantitative statistical analysis (generally) conducted as part of a systematic review. The results of different clinical trials relating to a specific question are statistically analysed and summarised. By combining the data, a meta-analysis provides more robust evidence than each individual study is able to on its own.

### ✖ Evidence summary
Click to close

Also referred to as Knowledge Summary, critically appraised topic (CAT), research synthesis or BestBET. An evidence summary is a standardised summary of research evidence based on a clinical question generated from a specific patient situation or problem, producing a clinical conclusion, or summary.

## Intervention (experimental) studies: The researcher designs an intervention (e.g. treatment, drug therapy, surgical method, etc.)

### ✖ Randomised controlled trial (RCT)
Click to close

A randomised controlled trial is an intervention study used to assess treatments or other interventions. Study subjects are randomly allocated to either the intervention group or a control group (which receives either no treatment, a placebo, the current best treatment or a comparator). As allocation of subjects is performed randomly, all other characteristics of the population should be equally distributed across the groups, thus decreasing bias. Therefore, evidence of a cause−effect relationship is more credible in these types of studies. Ideally, the study should be 'blinded', so that anyone involved with assessing study outcomes does not know which treatment each animal received, in order to limit conscious or unconscious bias.

## Observational studies: The researcher has no influence on which animals get the intervention; they only 'observe'

**✖ Cohort study**                                                      Click to close

A cohort study is an observational study where exposed and unexposed groups (cohorts) are followed over a defined period of time and occurrence of the outcome of interest (e.g. disease) is measured. Cohort studies can identify risk factors associated with the outcome and estimate incidence.

**✖ Case-control study**                                                Click to close

A case-control study is a retrospective study (occasionally prospective) comparing animals with the disease (cases) and without the disease (controls) of interest. The animals' histories are examined to identify risk factors for the disease.

**✖ Cross-sectional study**                                             Click to close

A cross-sectional study looks at a sample of the population at a single point in time, most commonly to determine the prevalence of a certain disease.

**✖ Controlled before-and-after study/Interrupted time series**         Click to close

A study comparing a group of animals before and after an event, or intervention. The effect of the event, or intervention, can then be identified by comparing the data sets.

**✖ Diagnostic test validation study**                                  Click to close

A diagnostic test validation study is used to establish the usefulness of new diagnostic tests. Animals are tested using the new diagnostic test and the current gold standard to establish the sensitivity, specificity and likelihood ratios for the new diagnostic test.

## Descriptive (non-comparative) studies: Description of what is happening – case findings, report a rare occurrence, etc.

Descriptive studies cannot be used to measure risk, causation, treatment effects or prevalence of a disease.

**✖ Case series**                                                       Click to close

A case series is a description of the presentation, diagnosis, treatment and/or outcome of a group of animals with the same disease. There are no disease-free animals for comparison, and any differences in management are not randomly allocated (for example, they may be due to the owners' preferences or different protocols between centres).

**✖ Case report**                                                       Click to close

A case report is a description of a single case (or small number of cases).

**✖ Expert opinion**                                                    Click to close

Expert opinion can be one individual's opinion or part of an elicitation process based on a panel of experts used to answer a question of interest. Expert opinion may provide some evidence where no information is available (e.g. new treatment efficacy or application to a new population). However these will almost always include some form of bias, for example, the selection of the evidence included.

## 4.2 Is the study design appropriate to answer your question?

As we learnt in **Ask**, there are several question types we can pose. These questions can, in turn, be answered by a number of different study types.

The table below shows which study types provide the most robust evidence for different question types.

**+ Table 9: Study types and levels of evidence**

| Question type | | | | | | |
|---|---|---|---|---|---|---|
| Level of evidence | Treatment | Prognosis | Risk | Diagnosis | Prevalence | Incidence |
| 1 (most robust) | Systematic review/meta-analysis | Systematic review/meta-analysis | Systematic review/meta-analysis | Systematic review/meta-analysis | Systematic review/meta-analysis | Systematic review/meta-analysis |
| 2 | Randomised controlled trial | Cohort study | Cohort study | Diagnostic test evaluation study | Cross-sectional study | Cohort study |
| 3 | Cohort study | – | Case-control study | – | – | – |
| 4 | Case report/series | Case report/series | Case report/series | Case report/series | Case report/series | Case report/series |
| 5 (least robust) | Expert opinion | Expert opinion | Expert opinion | Expert opinion | Expert opinion | Expert opinion |

This table has been adapted and simplified from the Oxford Centre for Evidence-based Medicine Levels of Evidence table (2009). Find out more about **the Oxford Centre for Evidence-based Medicine's Levels of Evidence tables** ⬈.

Remember: For all question types, meta-analysis and systematic reviews are usually more robust than individual studies.

In your clinical decision-making, you should rely on the most robust evidence available; you need to determine the level of evidence a paper provides in answering your clinical question. You may also need to accept that the 'best available' evidence may be lower down in this table than you might prefer; there may only be a few individual case reports rather than a systematic review. But take heart – some evidence is better than none!

Remember, determining the level of evidence is only the first step in appraising your paper. Within each 'level of evidence', further appraisal of the study methods and reporting may reveal that the evidence is not as robust as you first thought… On the contrary, a paper which sits lower on the 'level of evidence' table may provide more robust evidence.

## Table 10: Examples of the most robust study types for different types of clinical questions

| Type of Question | Example question | Study type that will best answer the question* |
|---|---|---|
| Treatment | In [dogs with osteoarthritis], does [supplementation with glucosamine and chondroitin] compared to [no supplementation] [reduce lameness]? | Randomised controlled trial, cohort study |
| Prognosis and Incidence | In [flat-coated retrievers with cutaneous lymphoma], does [being a male] compared with [being a female] affect [average life expectancy]? | Cohort study |
| Aetiology and Risk | In [ferrets], is [general anaesthesia by triple injectable agent] compared with [general anaesthesia by induction and inhalational agent] associated with [an increased risk of death]? | Cohort study, Case-control study, Cross- sectional study |
| Diagnosis | In [lactating dairy cattle] does [milk ELISA] compared with [serum ELISA] have [a better sensitivity and specificity for diagnosing fascioliasis]? | Diagnostic test validation study |
| Prevalence | In [adult racehorses] what is the [prevalence of laryngeal neuropathy] in winter? | Cross-sectional study |

*For all question types, meta-analysis and systematic reviews are more robust than individual studies.

# 5. Step 2: Appraise the quality of the study

**The level of evidence (Step 1) is a good indicator of how bias-prone the study design is likely to be.**

In most instances, however, there is overlap between the quality of papers in the different levels of evidence. For example, when assessing a treatment, a well-designed cohort study may provide better evidence than a poorly designed randomised controlled trial.

From a practical point of view, when reading papers, you should focus on the major issues that determine the quality of information and decide whether you agree or disagree with aspects of the study e.g. design, information content, objectivity, overall validity and the conclusions. But first, let's think about the statistics that might be in the paper.

# 5.1 What about statistics?

**You do not need to check, or be familiar with, every statistical procedure.**

However, being aware of the key issues relevant to each specific study design is helpful.

**Statistical significance doesn't necessarily equal biological significance.**

Even if some issues around statistics are unclear, you will get a good impression of the overall quality of the paper after assessment of the other quality criteria. Most research in this field has shown that the major flaws are usually related to study design and reporting, rather than statistics.

**You do not need to be a research scientist or a statistician to appraise the literature!**

## Statistics top tips

- Are details of statistical methods included?
- Look for a sample size calculation in the methods section. This should state how many animals will need to be studied in order to observe a statistical difference. More animals will be required if the difference between groups being studied is expected to be small.
- The probability value (p-value) can be set at any level, but standard practice is to use 0.05 as the level for significance. The p-value indicates whether an outcome is likely to be real or just due to chance. In this case, a $p < 0.05$ suggests the finding is likely to be real.
- In the results section, does the author use the correct number of animals and the same p-value for significance that were outlined in the methods section?

# 5.2 Critical appraisal and appraisal toolkits

**The appraisal needs to address aspects of the study design such as sample size, enrolment and exclusion criteria, case definition, allocation, blinding, statistical methods and objectivity in the discussion of the results.**

Appraising papers takes practice; the best way to do this is to find a paper that is relevant to your question, determine its level of evidence and then work through a critical appraisal toolkit for that study type.

Below are links to various critical appraisal toolkits; these provide a checklist to work through when reading a paper and appraising a specific study type. Toolkits are designed typically by study design but also by question type. Try a few and see which ones work for you.

- RCVS Knowledge toolkits ⎘
  - Controlled trial, cross-sectional study, case-control, cohort, systematic review, qualitative study

- Centre for Evidence-based Veterinary Medicine toolkits ⎘
  - Standard questions, cohort, case-control, randomised controlled trial (RCT), prognosis

- Critical Appraisal Skills Programme ⎘
  - Systematic review, qualitative, RCT, case-control, diagnostic, cohort, economic evaluation, clinical prediction rule

- University of Adelaide critical appraisal tools ⎘ for a wide range of study types

## 5.3 Other sources of bias

> What else could be a source of bias?

> In addition to the design and quality of the study, there are a few other considerations when deciding on the reliability of a paper.

## Reporting issues

As part of assessing the quality of a paper, the reader needs to evaluate how the author has reported the methods and results of their study. Careful appraisal of a paper may leave you uncertain about whether basic concepts of the study design were duly considered when planning and conducting the study, but have simply been poorly reported.

If you look through the literature, you will find articles that are biased: by poor reporting of crucial information e.g. age and medical history of the enrolled animals; by inappropriate definitions or diagnoses of diseases; or by a lack of (or inappropriate) control groups (Dean, 2013).

## Poor reporting

Poor reporting reduces the transparency of research and limits the reader's ability to critically appraise information because information that has not been included cannot possibly be appraised! The descriptions included in the paper should allow the reader to repeat the study in order to attempt to obtain an independent result. Examples of important deficits that may be found in veterinary literature are: missing information of the type of animals used in the study and how they were allocated; unclear description of diagnostic methods; and inappropriate documentation of treatments and outcome measurements.

> **TIP**: The use of critical appraisal toolkits can assist the reader to appraise the study's reporting methods.

Ultimately, if certain information is not given in a paper, you should regard this as not having been considered in the study design or study implementation. It is better to be safe than to be sorry when appraising literature that could inform important decisions you make about your patients!

## Reporting guidelines

Reporting guidelines (for example STROBE-VET ⧉ ) exist to guide authors and publishers of journals to ensure that papers are written with sufficient transparency and clarity. However, not all veterinary journals refer to reporting guidelines (Grindlay et al., 2014 reported the figure to be as low as 35%). It is important to note that reporting guidelines are different from critical appraisal toolkits, which assist readers to determine whether the evidence presented within a published paper is of good quality.

## Peer review

Peer review has been the quality control process for scientific publishing for many years, purportedly ensuring that information is checked and verified by subject experts before it is formally published. This saves the reader time; the onus is not on the reader to conduct the only fundamental analysis of the quality, accuracy and validity of the content. Peer-reviewed publications from the scientific and veterinary communities are key sources of information for EBVM practitioners.

However, some limitations and possible biases of peer review have been identified (Benos et al., 2007). For example, it has been demonstrated that gender and affiliation of the authors had an impact on the review outcomes. It is important to remember that peer review is not perfect, and published peer-reviewed studies vary in quality. However, studies show that manuscripts improve considerably after the peer-review process (Goodman et al., 1994; Benos et al.,2007).

## Publication bias

Traditionally, peer-reviewed scientific journals and the bibliographic databases that index them have been considered the best sources of evidence, but research into publication bias (Glanville et al., 2015) suggests that there is a need to go beyond these sources, because a significant proportion of research will not be published in peer-reviewed journals.

Publication bias occurs when researchers, or journal editors, decide to publish studies with 'positive' or statistically significant results (for example, showing that a treatment has a beneficial effect) but do not publish those with no 'significant' results (for example, when a treatment had no beneficial effect), despite it being a well-designed study. If this happens, analysis of the published results will not provide an accurate representation of current evidence.

This publication bias is perhaps particularly relevant in the field of clinical veterinary medicine, where practitioners may not be publishing their work as peer-reviewed articles, and much of the scientific data may be hidden in the so-called 'grey' literature (e.g. conference papers), or in practice records and case reports. For more information about finding this 'grey' literature, see Acquire: What sources of evidence are there?

## Sponsorship bias

Finally, check who funded the study. If it is, for example, a pharmaceutical company, the study may suffer from sponsorship bias which may lead to poor reporting e.g. not all results may be presented (Wareham et al., 2017). In general, not every sponsored project provides biased data, but you should carefully consider the quality criteria if you think that the study sponsor may have a vested interest in what and how the results are reported.

## Predatory journals

As mentioned in Acquire: Internet search tools, disreputable online publishers, sometimes referred to as 'predatory', have emerged in recent years. They exploit the open access model of publishing where the author pays a fee (an Article Publishing Charge or 'APC'). The disreputable publisher takes the money but fails to follow through with the peer-review and editing process that is the standard expected from a reputable scientific journal. This has led to a proliferation of freely available poor-quality research and although these would not be listed by databases, such as MEDLINE, they will be found by Google searches.

# 6. Step 3: Your conclusion – Is the paper of sufficient quality?

**The critical appraisal conducted in Step 2 should help you decide whether the conclusions drawn from the study are valid.**

You may agree with the conclusions stated by the authors, or you may disagree with all or part of their conclusions, and may have drawn your own valid conclusions.

A poor overall evaluation does not inevitably mean that the information is completely wrong or useless, but it indicates that the risk of bias is quite high. Therefore, you should be cautious when considering implementing the findings from papers in clinical practice, especially those of questionable quality.

Quality evidence is only useful if it is relevant to your clinical question. If you are unsure whether the evidence you have found is relevant, read 'How relevant is the evidence?' in the next section Apply.

**If you feel the paper is not of sufficient quality, or relevance to support your clinical decision-making, do not be afraid to discard it!**

**If you feel the paper does provide some valid and relevant evidence, you can move on to the next step and determine whether and how you can Apply this evidence to your decision-making process. This is a great outcome of using EBVM!**

# 7. Quiz

1. When considering treatment options, select the four strongest types of evidence from the following list:

☐ Case report

Incorrect

☐ Cohort study

Correct

☐ Expert opinion

Incorrect

☐ Internet

Incorrect

☐ Case series

Correct

☐ Randomised controlled trial

Correct

☐ Systematic review

Correct

☐ Textbook

Incorrect

**The standard hierarchy of evidence for answering questions of treatment is: meta-analysis> systematic review> randomised controlled trial> cohort study> case-control study> cross-sectional study> case series> case report> textbook/anecdotal/expert opinion.**

Check answer    Show answers and explanations

2. In a randomised controlled trial, what is the purpose of random allocation?

○ Characteristics of study participants are equally distributed across comparison groups

Correct. Random allocation reduces the risk of selection bias and distributes participants equally across comparison groups.

○ To provide evidence of an important effect of the intervention

Incorrect

○ Study participants do not know who received the placebo treatment

Incorrect

○ Researchers do not know who received the intervention or the placebo

Incorrect

○ Statistical analysis of the data will be straightforward

Incorrect

Check answer    Show answers and explanations

3. You are appraising a study comparing the effects of two different diets for chronic kidney disease in cats. The researchers were not blinded to the diet being fed. What potential weakness does this introduce to the study design?

○ Unconscious bias

Correct. Blinding of the researcher who is measuring the outcomes is designed to limit any conscious or unconscious bias that may arise from knowing which patient received which treatment. Non-blinding is a study weakness that you should be able to identify when appraising the literature.

○ Lack of study power

Incorrect. Lack of study power means that there were not enough study participants in the comparison groups in order to show the statistical significance hypothesised. Blinding of the researcher who is measuring the outcomes is designed to limit any conscious or unconscious bias that may arise from knowing which patient received which treatment. Non-blinding is a study weakness that you should be able to identify when appraising the literature.

○ Non-random allocation

Incorrect. Non-random allocation means that when patients were allocated to treatment groups, this was not done randomly, which may increase bias. Blinding of the researcher who is measuring the outcomes is designed to limit any conscious or unconscious bias that may arise from knowing which patient received which treatment. Non-blinding is a study weakness that you should be able to identify when appraising the literature.

○ Uncontrolled variables

Incorrect. Uncontrolled variables means that there are factors other than those you are measuring which may influence the outcomes that you measure. Blinding of the researcher who is measuring the outcomes is designed to limit any conscious or unconscious bias that may arise from knowing which patient received which treatment. Non-blinding is a study weakness that you should be able to identify when appraising the literature.

○ Poorly matched control group

Incorrect. Poorly matched control groups is an example of selection bias and leads to uncontrolled variables. Blinding of the researcher who is measuring the outcomes is designed to limit any conscious or unconscious bias that may arise from knowing which patient received which treatment. Non-blinding is a study weakness that you should be able to identify when appraising the literature.

Check answer    Show answers and explanations

4. Why are systematic reviews and meta-analyses considered to provide the best evidence?

○ Their statistical analyses are complicated

Incorrect. Many randomised controlled trials or cohort studies can have very complicated statistical analyses! Systematic reviews and meta-analyses objectively summarise all available evidence to answer a specific question using rigorous selection criteria for inclusion of studies.

○ They include all available information on a particular topic, regardless of where it was obtained from

Incorrect. Systematic reviews and meta-analyses objectively summarise available evidence to answer a specific question using rigorous selection criteria for inclusion of studies.

○ They are written by experts in the topic of interest

Incorrect. Systematic reviews and meta-analyses can be written by someone with no former knowledge of the particular subject, they need only be an expert in writing systematic reviews and meta-analyses. Systematic reviews and meta-analyses objectively summarise available evidence to answer a specific question using rigorous selection criteria for inclusion of studies.

○ They objectively summarise available evidence to answer a specific question using rigorous selection criteria for inclusion of studies

Correct. Systematic reviews and meta-analyses are both objective and systematic, and they contain all of the relevant evidence available, ranked according to strength of evidence.

○ They combine clinical trials, cohort studies, case-control studies and expert opinion all in one study

Incorrect. Some systematic reviews may only contain randomised controlled trials, others may contain a large variation in study type. Systematic reviews and meta-analyses objectively summarise available evidence to answer a specific question using rigorous selection criteria for inclusion of studies.

Check answer    Show answers and explanations

# 8. Summary

## Learning outcomes

You should now be more familiar with how to:

- describe the most important factors that should be appraised when you read a paper

- explain how to appraise literature (and other information)

- use tools that support the appraisal process.

**Now move on to the Apply section** →

# 9. References

Benos, D. J. et al. (2007) The ups and downs of peer review. *Advances in Physiology Education*, 31 (2), pp. 145–152

Cockcroft, P. D. (2007) Clinical reasoning and decision analysis. *Veterinary Clinics of North America: Small Animal Practice*, 37 (3), pp. 499–520

Dean, R. (2013) How to read a paper and appraise the evidence. *In Practice*, 35 (5), pp. 282–285

*EBVM Toolkit 4 - what type of study is it?* [RCVS Knowledge] [online] Available from: https://knowledge.rcvs.org.uk/document-library/ebvm-toolkit-4-what-type-of-study-is-it/ [Accessed 19 November 2020]

Glanville, J. et al. (2015) A review of the systematic review process and its applicability for use in evaluating evidence for health claims on probiotic foods in the European Union. *Nutrition Journal,* 14:16

Glasziou, P. et al. (1998) Applying the results of trials and systematic reviews to individual patients. *ACP Journal Club*, 129 (3), pp. A15–6

Goodman, S. N. et al. (1994) Manuscript quality before and after peer review and editing at Annals of Internal Medicine. *Annals of Internal Medicine,* 121 (1), pp. 11–21

Greenhalgh, T. (2019) *How to read a paper: the basics of evidence-based medicine and healthcare*. 6th Ed. Hoboken, NJ: John Wiley & Sons

Grindlay, D. J. et al. (2014) A survey of the awareness, knowledge, policies and views of veterinary journal Editors-in-Chief on reporting guidelines for publication of research. *BMC Veterinary Research*, 10:10. Available  from: http://bmcvetres.biomedcentral.com/articles/10.1186/1746-6148-10-10

*Guidance on scientific writing* [EQUATOR Network] [online] Available from: https://www.equator-network.org/library/guidance-on-scientific-writing/ [Accessed 19 November 2020]

Holmes M.A. and Ramey D.W. (2007) An introduction to evidence-based veterinary medicine. *Veterinary Clinics of North America: Equine Practice*, 23 (2), pp.191-200

Holmes M. A. (2007) Evaluation of the evidence. *Veterinary Clinics of North America: Small Animal Practice*, 37 (3), pp. 447–462

*How to read a paper: a list of resources explaining how to read and interpret different kinds of papers* [BMJ] [online] Available from: https://www.bmj.com/about-bmj/resources-readers/publications/how-read-paper/ [Accessed 19 November 2020]

Kastelic, J. P. (2006) Critical evaluation of scientific articles and other sources of information: an introduction to evidence-based veterinary medicine. *Theriogenology*, 66 (3), pp. 534–542

*Oxford Centre for Evidence-Based Medicine: levels of evidence (March 2009)* [CEBM] [online] Available from: https://www.cebm.ox.ac.uk/resources/levels-of-evidence/oxford-centre-for-evidence-based-medicine-levels-of-evidence-march-2009 [Accessed 19 November 2020]

Sargeant, J. M. et al. (2010) The REFLECT Statement: Reporting guidelines for randomized controlled trials in livestock and food safety: explanation and elaboration. *Journal of Food Protection*, 73 (3), pp. 579–603

Simoneit, C., Heuwieser, W. and Arlt, S. (2011) Evidence-based medicine in bovine, equine and canine reproduction: quality of current literature. *Theriogenology*, 76 (6), pp. 1042–1050

Straus, S. E. and Sackett, D. L. (1998) Using research findings in clinical practice. *BMJ,* 317:339

Wareham, K.J., et al. (2017) Sponsorship bias and quality of randomised controlled trials in veterinary medicine. *BMC Veterinary Research,* 13, 234. Available from: https://bmcvetres.biomedcentral.com/articles/10.1186/s12917-017-1146-9

**Now move onto the Apply section** →

# Apply

# Table of contents

# 1. Introduction



**Once you have [Acquire](#)d and [Appraise](#)d the evidence on your particular clinical question, it is important to determine whether the answers you have generated can be applied to your circumstances: the clinic, location or country where you work, the case in front of you and/or the availability of therapies, and the individual needs of the owner. The application of evidence into practice can sometimes be challenging, as you will see in this section.**

## By the end of this section you will be able to:

- use a structured framework to determine whether the evidence is applicable to you, your patients, your environment and the owner

- develop clinical practice guidelines and protocols

- describe ways of communicating evidence to colleagues and clients.

# 2. Applying evidence to practice

> **It has been shown that implementation of evidence into practice is one of the most challenging things to do when compared with finding the evidence and appraising it (Bergus et al., 2004).**

There are a number of reasons why it is difficult to apply evidence to practice, but it ultimately comes down to the availability of essential resources (Sackett and Straus, 1996) and the motivation of the individual clinician to make the changes (Kiefe et al., 2001).

Clinicians are trained to assimilate information gathered through taking a clinical history, performing a clinical examination on an animal or group of animals, interpreting diagnostic tests, monitoring previous responses to treatments and understanding client circumstances and expectations (Holmes and Cockcroft, 2004). Integrating evidence works on the same principles that veterinarians use every day, with the evidence becoming a component of the decision-making, alongside the circumstances of the owner and animal in front of you. Through integrating evidence, clinicians continually adapt and update their practice over time.

## Example: Is it necessary to measure coagulation parameters before liver biopsy, or not?

In the past, it was recommended that clotting times were evaluated prior to performing a liver biopsy in the horse. There is a risk of haemorrhage associated with the procedure, and in ensuring horses had normal coagulation parameters, this risk was perceived to be lower.

However, measuring clotting times was an added expense and delayed the liver biopsy procedure, sometimes putting clients off performing this important diagnostic step. In 2008 evidence emerged that the risk of haemorrhage was both lower than previously thought, and unrelated to coagulation abnormalities (Johns and Sweeney, 2008). This evidence was rapidly incorporated into practice and now clients are only offered pre-biopsy clotting profiles where there is overt evidence of a clotting disorder (bleeding diatheses).

# 3. Individualised application of the evidence into practice

> **Consider the relevance of the evidence to your individual clinical scenario**

You may not realise it, but you have been considering the relevance of the evidence right from developing your (S)PICO question at the start of this tutorial in Ask. Developing a well-structured (S)PICO then enabled you to Acquire evidence relevant to your clinical scenario. In section Appraise you decided whether this relevant evidence was of sufficient quality to *Apply* to your clinical scenario. If you are still unsure whether the evidence you have found is relevant, the following section will help you make a decision.

## How relevant is the evidence?

When you read a study, you must make a judgement about how similar your patient is to the population or sample being examined in that particular study, and whether that study is worth considering for the individual circumstances in front of you.

Since a perfect study examining the whole population of animals you are interested in will rarely exist (especially in veterinary medicine!), it is up to you to decide if the evidence you have found is pertinent to your individual clinical question. Studies are often conducted on a number of subject animals and may therefore only be truly representative of a particular subset of a particular population of animals.

### Some pertinent questions to ask may be:

- Does the population of animals in the study represent the type of animals that you see (e.g. animals seen at referral practices versus first opinion practices)?
- If the disease is caused by an infectious agent, are there important differences in strains, serotypes, or antimicrobial resistance patterns in the study area versus your practice area?
- Does the evidence focus on animals with single morbidities (as opposed to animals with comorbidities)?
- Does the evidence in the study focus on using one therapy versus combinations of therapies?

> **Thinking about how to apply the evidence from published studies to the individual animal, or group of animals you are working with raises four different questions, as outlined by Del Mar et al. (2008):**
>
> 1. What are the potential effects of treatment, both beneficial and harmful?
> 2. Are there differences in the effects of treatments on different sub-groups of animals?
> 3. Are there differences in levels of risk between different groups/sub-groups of animals?
> 4. How do the benefits and harms relate to the individual animal or group of animals you have in front of you?

## Clinical scenario

The following example will illustrate these four questions using a clinical scenario about the use of analgesic products for calf dehorning.

Click on each of the following headings to expand the text.

When making clinical decisions, it is important for veterinarians to identify the best evidence based on the benefits and harms of any interventions proposed.

---

## 🔖 Clinical Scenario

### Calf-dehorning example

In some countries, long-acting analgesic products are not approved for pain relief in livestock. Some of these countries allow veterinarians to use medicines in an off-licence capacity, when the health of the animal is threatened and when the veterinarian determines that a particular drug is indicated. Extra-label drug usage, however, is not permitted if it results in violating food residue legislation.

Conversely, in many countries, both long-acting and short-acting products are approved as therapy to provide pain relief.

Because you have recently begun working at a practice that has not historically used analgesia for long-term pain relief post-dehorning in cattle, you wonder if you should propose using a non-steroidal anti-inflammatory drug (NSAID) for calves less than 6 months of age being dehorned, and if so, which NSAID would be preferable, parenteral flunixin or meloxicam? You search the literature and find two references which appear to be particularly relevant to this question:
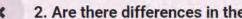
- Heinrich, A. et al. (2010) The effect of meloxicam on behavior and pain sensitivity of dairy calves following cautery dehorning with a local anesthetic. *Journal of Dairy Science*, 93 (6), pp. 2450-2457. Available from: **https://doi.org/10.3168/jds.2009-2813** ☑

- Fraccaro, E. et al. (2013) A study to compare circulating flunixin, meloxicam and gabapentin concentrations with prostaglandin $E_2$ levels in calves undergoing dehorning. *Research in Veterinary Science*, 95 (1), pp. 204-211. Available from: **https://aperto.unito.it/handle/2318/131393#.X64vjmj7RPY** ☑ [Accessed 13 October 2020]

In the first study (Heinrich et al., 2010), you note that meloxicam (0.5 mg/kg) was shown to significantly prevent the relapse of pain after the effect of a cornual block had worn off in calves undergoing dehorning with cautery when compared to placebo-treated calves. Pain was measured by reduced sensitivity to pressure, ear-flicking and head-shaking, and meloxicam-treated calves were significantly different from calves receiving a placebo ($p < 0.05$). This research was done on Holstein heifer calves that were six weeks of age.

The second study (Fraccaro et al., 2013) described significantly lower blood prostaglandin E2 concentrations in the flunixin-treated (2.2 mg/kg) group compared to the placebo group after surgical/cautery dehorning; the difference between concentrations in the meloxicam group and the placebo group was not statistically significant. However, meloxicam had a 2½ times longer half-life than flunixin, suggesting that its effect should last longer. This research was done on Holstein steer calves that were six months of age.

### When appraising the relevance of this evidence, you consider a number of things:

- Both studies were performed in cattle.

- Heinrich's study was undertaken in Ontario, Canada, while Fraccaro's study was done in Kansas, USA. Again, you think it is unlikely that the region would make a difference in interpreting the results of these particular studies. Location will not have an impact on comparing analgesia effects.

- Heinrich's study was undertaken in a dairy production system, while Fraccaro's study was in a beef production system. You consider this, but decide that it is unlikely that the production system would make a difference in interpreting these study results.

- Both studies utilised research animals, although, again, you consider it unlikely that the source of animals would make a difference in interpreting the study results.

- In both studies, animals were randomly allocated to the treatment groups, minimising biases associated with group allocation.

- Heinrich's study involved two groups of 30 calves, whilst Fraccaro's study had much smaller groups (seven calves in each group). It is possible, therefore, that because of the smaller group sizes, the effect of the individual variation of animals within Fraccaro's study might be more likely to account for some or most of the differences between the groups.

**✖  2. Are there differences in the effects of treatments on different sub-groups of animals?**

Certain sub-groups of animals (e.g. certain age groups) may be more likely to respond either positively or negatively to specific interventions. When thinking about how you might apply the evidence, you will need to consider which sub-groups of animals were utilised in the research being considered.

---

🔖 **Clinical Scenario**

### Calf-dehorning example

Fraccaro's study showing flunixin was better than meloxicam used a surgical procedure for dehorning, followed by cautery (for bleeders); this procedure was also performed in older calves, whereas Heinrich's study used cautery dehorning in younger calves. The Fraccaro study also had a small sample size, and only measured changes in a blood parameter (prostaglandin E2), whereas Heinrich's study used behavioural changes. After considering all of this, you decide that it is unclear whether the age of the calves would alter the interpretation of the studies, but you keep the details in the back of your mind.

---

**✖  3. Are there differences in levels of risk between different groups/sub-groups of animals?**
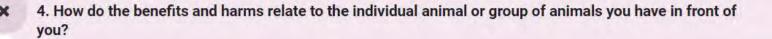
By the nature of how and where they are kept, or their innate attributes, different groups or sub-groups of animals may have different levels of immunity and exposure to various pathogens. These differences may lead to different manifestations of disease severity in these different groups.

---

🔖 **Clinical Scenario**

### Calf-dehorning example

It would be difficult to argue that there is a difference in the risk of pain from dehorning between a six-week-old calf or a six-month-old calf. Both ages would feel pain, although one could argue that the size of the horn in a six-week-old calf is smaller than in a six-month-old calf, and therefore the dehorning procedure would be more painful in a six-month-old calf than a six-week-old calf. However, there is no evidence that age groups would make a difference to treatment response in this particular case and scientific question.

**4. How do the benefits and harms relate to the individual animal or group of animals you have in front of you?**

It is down to you as the veterinarian to make a judgement on the applicability of the research findings to your patients, which could involve a number of considerations. In addition to the research results, you might choose to reflect on your previous experience with similar cases, or to have a more in-depth discussion with the owner. You might also want to discuss the matter with colleagues, or consult an online forum to gain a broader view of the question at hand.

> 🔖 **Clinical Scenario**
>
> Calf-dehorning example
>
> It is unclear whether different groups of animals would make a difference in interpreting the study results. Perhaps the type of dehorning could make a difference in the interpretation of the results. The combination of surgical dehorning and cauterization of bleeders would be expected to produce more tissue trauma and pain than simple cauterization, as well as on-going infection and its associated pain.

Another pertinent question to ask might be whether or not the findings of the studies are clinically relevant to your case, that is, will they really make a difference to the animal(s) in front of you? Once again, it is up to you to make a judgement about whether or not the outcomes measured would be expected to translate into meaningful clinical benefits to the patient and owner in front of you.

> 🔖 **Clinical Scenario**
>
> Calf-dehorning example
>
> Because Heinrich's study assessed behavioural changes in six-week-old calves, it would seem to be more clinically relevant than Fraccaro's study, where only changes in blood parameters were measured in six-month-old calves.

If you do not think the evidence from the papers you are considering is relevant enough to apply to the animal or group of animals you are treating, you can have a discussion with the owner of the animal(s) about the uncertainties around the options available (Legare 2009). Additionally, you may choose to:

1. Rely on the information in other forms of evidence such as textbooks, and online websites

2. Do what you would normally do in these circumstances before you were aware of the published evidence, or

3. Rely on your local clinic's advice or guidelines, or advice from colleagues who have handled these types of clinical problems before.

> 🔖 **Clinical Scenario**
>
> Calf-dehorning example
>
> The Heinrich study would seem to provide relevant evidence in relation to the particular circumstance in front of you, while the Fraccaro study suggests that meloxicam could potentially last longer than flunixin. The Fraccaro study also only provides blood-related evidence of flunixin perhaps being better than meloxicam with respect to prostaglandin E2 concentrations. Without any clinically relevant observations, however, this evidence would not be enough to suggest that it is preferred over meloxicam, even in six-month-old Holstein steer calves being surgically dehorned.

# 3.1 Consider the individual circumstances of your clinical scenario

**Now that you have decided whether your evidence is relevant to your clinical question, you need to decide whether the evidence is applicable to your individual set of circumstances.**

Let's revisit the definition of evidence-based veterinary medicine:

> Evidence-based veterinary medicine is the use of the best relevant evidence in conjunction with clinical expertise to make the best possible decision about a veterinary patient. The circumstances of each patient, and the circumstances and values of the owner/carer, must also be considered when making an evidence-based decision. (Centre for Evidence-based Veterinary Medicine)
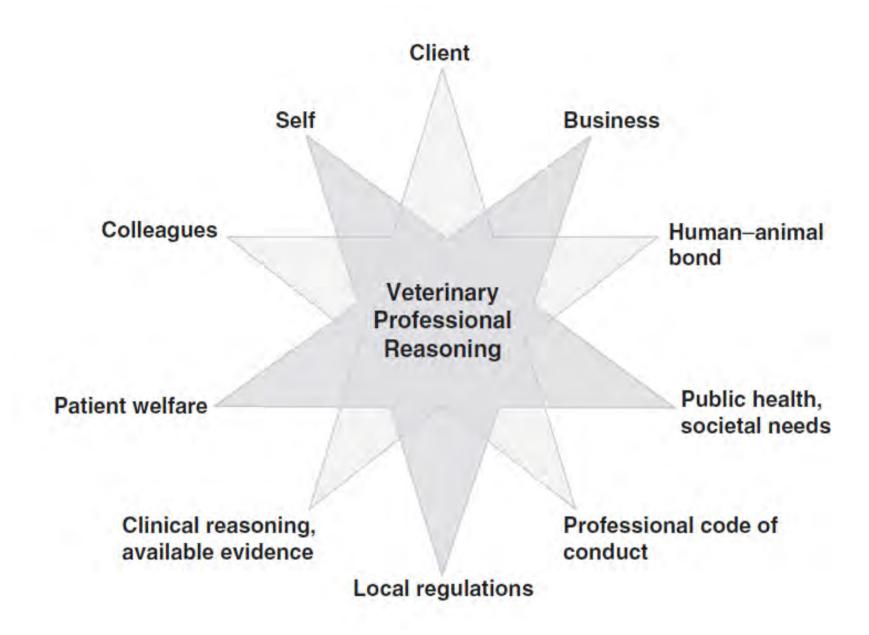
Now you need to use your professional knowledge, skills and judgement to consider whether the evidence is applicable to the *individual set of circumstances* surrounding your clinical dilemma. Listed below are some of those circumstances to be considered:

- the patient−(owner)−clinician relationship
- a sensitivity to the human-animal bond
- expectations of end-of-life care
- animal welfare
- veterinary business practice
- funding and insurance models
- equipment limitations
- varying cultural beliefs
- clinician confidence in new procedure or treatment protocol…

It is useful to apply a framework within which to consider these factors. Armitage-Chan (2020) has developed such a framework which takes the clinician through a step-by-step process of 'professional reasoning' (Figure 1) and this could be used as a guide when integrating evidence into practice. Through a process of information gathering, the clinician must consider all the stakeholders involved in the decision-making process, represented by the star diagram below.

# Figure 1: Stakeholders in veterinary professional reasoning

(from Armitage-Chan, 2020; included with permission from the author, the *Journal of Veterinary Medical Education* and the University of Toronto Press)



The diagram can be helpful to consider how various dilemmas may arise; sometimes your clinical decision may not fit with the best evidence, it may not always be the same as that of your colleagues.

Recent work on identity formation suggests that when veterinarians act in a way which doesn't sit well with their personal goals and values, they can experience identity dissonance, which can lead to anxiety and a lack of psychological well-being (Armitage-Chan and May, 2019).

It is useful to recognise that there may be multiple, equally valid ways of approaching a clinical scenario. The following examples help to illustrate potential dilemmas that may arise in everyday situations.

## Example Scenario

### Elderly pet dog – what are the options for the client?

An elderly couple with no pet insurance, present their bitch, Molly, who is unwell. You diagnose an open pyometra. You have read a recent Knowledge Summary with the following clinical bottom line:

> Ovariohysterectomy combined with antibiosis is more effective in achieving clinical cure than systemic antibiosis alone. Systemic antibiosis may be associated with recrudescence of the pyometra and the evidence base is weaker for this approach. **Read the full Knowledge Summary** ⧉

You know that surgery would give a better chance of a good short- and long-term outcome for Molly. Your other options are medical management with antibiotics (with a high risk of recurrence, even if successful in the short-term), or euthanasia. Molly is still eating and cardiovascularly stable and the owners have financial limitations to undertaking an ovariohysterectomy.

In this case, together with the owners you decide that you will trial a course of antibiotics with a view to re-assessing Molly regularly and if her condition worsens, she will be euthanised. You might feel uncomfortable with this approach, knowing that surgery could successfully treat the pyometra; you make sure you discuss further options, such as euthanasia, if there is no improvement and warn the owners of the likelihood of recurrence.

## Example Scenario

### The cost of efficiency

Your interest in infection control led you to read an article in a veterinary nursing publication about using alcohol hand rubs as an alternative to the more traditional hand scrubbing. An online search of the current literature leads you to a knowledge summary with the following clinical bottom line:

> The current literature suggests that the use of alcohol hand rubs provide similar, if not better, reductions in bacteria colony forming units [when compared to traditional methods of hand scrubbing], both immediately after hand antisepsis and in the immediate postoperative period. Read the full Knowledge Summary ⧉

Using alcohol hand rubs would mean that the time spent 'scrubbing in' will be reduced, with the added potential benefit of better compliance and a reduction in patient anaesthetic time, especially when time is more critical.

At the moment the practice buys scrubbing brushes and chlorhexidine which are a similar cost to alcohol hand rub and is considering changing. However, a global pandemic made all alcohol hand rubs very difficult to source resulting in the cost of these products rising, and outweighs what the practice is already paying for scrub brushes and chlorhexidine. Therefore, the practice decides the current protocol (scrubbing with chlorhexidine) will remain in place and the lead nurse is tasked with reviewing the situation (cost and availability of alcohol hand rub) at regular intervals.

# 3.2 Sharing evidence with your clients

> **After acquiring as much information as possible, the clinician is required to discuss their decision-making with the relevant parties, such as the client and relevant colleagues.**

Shared decision-making (SDM) is receiving more attention in EBM and EBVM; the *British Medical Journal* included SDM as one its six proposals for EBM's future in their online [EBM toolkit](#) ↗.

There are a number of ways to share and discuss evidence with your clients through verbal and written communication channels.

## 👥 In-person discussions

Owners may be wary of new treatments or different approaches, particularly if they have had previous success through other treatment approaches, so it will be of benefit to spend time discussing any new evidence with them. Discussing evidence with clients will potentially improve uptake of the new approach and owner compliance in seeing it through.

## 📰 Electronic and/or paper copies of journal articles

For clients who have some medical or scientific background, providing electronic and/or hard copies of open access literature relevant to the discussion can add to your credibility on the subject and provide convincing data to the clients.

## 📖 Client leaflets

Many practices are producing their own client leaflets to educate owners. Investigate the resources available to you in your practice. Maybe you could develop them?

Click to expand and read the scenario-based examples below.

---

✖ **Farm example**　　　　　　　　　　　　　　　　　　　　　Click to close

You visit a farm with a scouring calf. You have recently read a BestBET which has the clinical bottom line:

> " Feeding milk in addition to an oral rehydration solution may help scouring calves to maintain or even gain weight when compared with feeding oral rehydration solution alone. **Read the full BestBET** ↗

You discuss this with the farmer, who usually withholds milk from scouring calves. During the discussion you determine the reasons why the farmer withholds milk and what that approach is based on. The discussion helps you to understand why the farmer may be reluctant to change and enables you to make a good case for adopting the recommendations of the new evidence. As a result, you decide together that you will trial the combination of milk and oral fluids.

Mrs. Lee has been using a glucosamine supplement for the last two years with the aim of reducing the clinical signs of osteoarthritis in her pet dog, Barney. You read a **BestBET** ⬀ and a 'What is the Evidence?' ⬀ publication in the *Journal of the American Veterinary Medical Association* outlining that this supplement may not be effective. Mrs. Lee has been using the product for some time and is convinced that there are some benefits gained by using it, although she still feels that Barney is reluctant to walk as far.

You take time to discuss with Mrs Lee the benefits of other therapies (such as carprofen or other NSAIDs) for reducing the clinical signs of osteoarthritis which have been recognised in research studies. During the discussion, you provide her with the opportunity to ask questions about the expectations of the treatment, the financial implications and any potential risks for her pet dog. You also find out what outcome is important to Mrs Lee from treating her dog; she reveals that she misses their daily walks to the park now he can't walk as far and this is causing her some loneliness.

You think NSAIDs could manage Barney's pain better and enable him to walk to the park again. You are prudent to guide the process and expectations of the treatment change. You develop a structured treatment regime in conjunction with Mrs. Lee, based on high-quality evidence, to implement treatment with NSAIDs, stopping the glucosamine, for a "test" period. It is crucial that together, you identify re-assessment points and schedule check-ups proactively so that Mrs. Lee can provide you with feedback about the new regime and how it is performing in relation to how comfortable Barney is.

A list of sources of evidence summaries can be found in Table 2 of a paper by Brennan et al. (2020) ⬀.

# 4. Developing clinical practice guidelines and protocols

**By discussing cases and how they are managed with other staff within your practice, it may become apparent that having some structured guidance based on the existing evidence may be beneficial.** If the evidence doesn't exist, making sure that the practice is approaching these type of cases in a broadly similar way will be important. One way of doing this is by creating clinical practice guidelines and protocols.

Through the development of unambiguous and concise clinical guidelines and protocols, practitioners can be motivated to trial new ways of approaching a case. Both protocols and guidelines support clinician decision-making and are evidence based.

Despite the terms frequently being used interchangeably, protocols and guidelines are not the same thing. As the names imply, protocols are much more rigid rules compared to more flexible guidelines. However, both should be clear and concise and include sufficient information so that they can be understood without reference to other supporting materials.

## Guidelines

Clinical guidelines are intended to provide information to assist decision making in the management of a case based on an appraisal of the current best evidence. (Hewitt-Taylor, 2004)

Clinical guideline recommendations should be unambiguous, consistent and define target patient populations and expected clinical outcomes. Successful guidelines are simple documents that guide veterinarians through a process (be that diagnostic, treatment or any other process), without describing how each procedure is delivered to a patient. Guidelines can assist communication of evidence within a practice or community of veterinarians.

See RCVS Knowledge resources which include tools to assist in creating guidelines, links to published guidelines and CPD ⤤.

## Protocols

Protocols are rigid statements or rules which must be adhered to. A protocol sets out a precise sequence of activities in the management of a specific clinical condition (Hewitt-Taylor, 2004). In areas such as biosecurity, surgical checklists, radiation safety and operating procedures for equipment, protocols are more appropriate than guidelines.

You might have an area of practice in which you feel improvements could be made. Consider the following example:

Your practice has recently invested in laparoscopic equipment. You are the only vet currently experienced and confident in performing laparoscopic ovariectomy in dogs. You wonder whether a change in practice from open ovariectomy would be beneficial for the practice's patients. You find a relevant BestBET supporting this theory with the following clinical bottom line:

> ❝ In small dogs (<10kg), use of a laparoscopic ovariectomy technique may lead to greater activity levels in the 48 hour post-operative period than if ovariectomy is performed using a conventional midline open technique. (Read the full BestBET ⤤)

You also find a knowledge summary comparing ovariectomy (OVE) with ovariohysterectomy (OVH), which concludes:
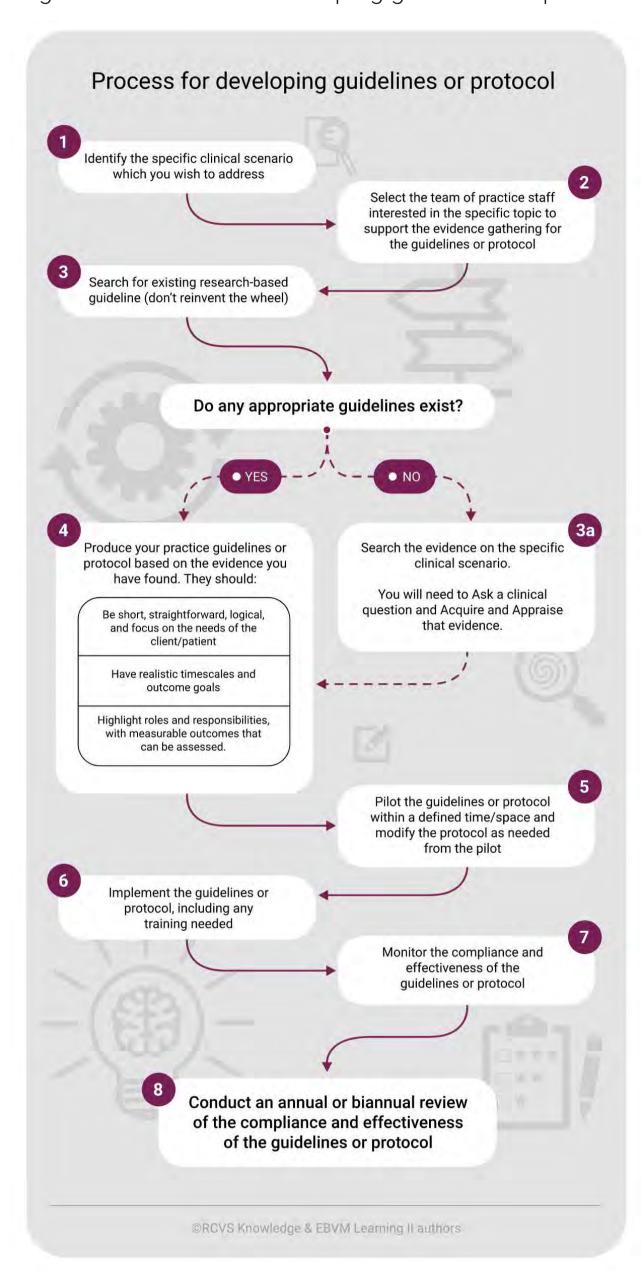
> ❝ whilst the evidence does suggest OVE may be associated with some modest improvement in surgical time and incision length, due to the small sample sizes and varying techniques used, further studies are required before definitive conclusions can be made. (Read the full Knowledge Summary ⤤)

The practice team agrees with your recommendation and decides to adopt laparoscopic surgery more widely. To support the effective implementation of this change, you produce a clinical protocol outlining the important steps in setting up the equipment and performing the laparoscopic technique and set up training for the rest of the team, including surgical training for operating vets and nurses and informing support staff who may be involved in communicating with owners.

Whether you choose to develop a protocol or a guideline, there are a number of steps involved:

1. Identify the specific clinical scenario for which you wish to address.

2. Select the team of practice staff interested in the specific topic to support the evidence gathering for the guidelines or protocol.

3. Search for existing research-based guidelines (don't reinvent the wheel). If nothing appropriate exists, then search the evidence on the specific clinical scenario. You will need to Ask a clinical question and Acquire and Appraise that evidence.

4. Produce your practice guidelines or protocol based on your evidence. They should be short, straightforward, logical, and focus on the needs of the client/patient; have realistic times and outcome goals; and highlight roles and responsibilities, with measurable outcomes that can be assessed).

5. Pilot the guidelines or protocol within a defined time/space and modify the protocol as needed from the pilot.

6. Implement the guidelines or protocol, including any training needed.

7. Monitor the compliance and effectiveness of the guidelines or protocol.

8. Conduct an annual or biannual review of the compliance and effectiveness of the guidelines or protocol.

# Figure 4: Process for developing guidelines or protocol



## Process for developing guidelines or protocol

**1** Identify the specific clinical scenario which you wish to address

**2** Select the team of practice staff interested in the specific topic to support the evidence gathering for the guidelines or protocol

**3** Search for existing research-based guideline (don't reinvent the wheel)

**Do any appropriate guidelines exist?**

● YES        ● NO

**4** Produce your practice guidelines or protocol based on the evidence you have found. They should:

- Be short, straightforward, logical, and focus on the needs of the client/patient
- Have realistic timescales and outcome goals
- Highlight roles and responsibilities, with measurable outcomes that can be assessed.

**3a** Search the evidence on the specific clinical scenario.

You will need to Ask a clinical question and Acquire and Appraise that evidence.

**5** Pilot the guidelines or protocol within a defined time/space and modify the protocol as needed from the pilot

**6** Implement the guidelines or protocol, including any training needed

**7** Monitor the compliance and effectiveness of the guidelines or protocol

**8** Conduct an annual or biannual review of the compliance and effectiveness of the guidelines or protocol

©RCVS Knowledge & EBVM Learning II authors

The use of clinical practice guidelines and protocols provides practitioners with a reflective tool. Periodically and systematically assessing the effectiveness is important to ensure that they have had the desired effect on patient outcomes and as part of practice quality improvement, or clinical governance. Techniques for doing this assessment can be found in the next stage of the EBVM cycle under Assess.

# 5. What factors should I consider before implementing a change?

**Read on for additional considerations on how you might approach implementing changes to your team's clinical practice.**

Any changes, however small, can have a large impact; this may impact on you individually but also at the level of the practice. It is impossible to anticipate all the potential effects of a change, but it is important to consider as much detail as you can prior to implementing any changes.

There are other factors you should take into account when considering implementing changes to your team's clinical practice. It is possible that your colleagues may not agree with the changes that you are suggesting. Many barriers, for example time pressures, have been highlighted in the literature in relation to reasons why evidence is not applied into practice (Legare, 2009). Don't let this stop you from making a change individually to the patients that are in your care. After discussion with your colleagues, perhaps at a practice meeting, or journal club, you might influence others to embrace changes too.

Research looking at the success of change implementation in the medical field (Haley et al., 2012) identified factors which facilitated and hindered proposed actions. We will explore each of these challenges in more detail:

---

**✖ Who**                                                    Click to close

Reflect on previous episodes of 'change' within your practice; who was for the change? who was against the change? what were the facilitators and barriers to change?

> You have noticed that, on occasion, the equine vets in your practice approach lameness cases differently, leading to confusion amongst the support staff in your clinic as to what equipment and consumables they should be preparing. You are interested in developing an evidence-based standardised framework that the vets in your practice can follow for carrying out lameness work-ups. You expect this approach to lead to fewer misdiagnoses, and it should assist the support staff in their preparation.
>
> You made an attempt at introducing a new framework a year or so ago, but as the junior vet, you got some resistance from the two senior vets in the practice.
>
> Since the support staff are struggling with the preparation for these assessments, you decide to talk to one of them, Lizzie, who has worked in the practice for twenty years, to talk her through your suggestion. The senior vets seem more receptive to the idea when you bring it up again with Lizzie's support.

---

**✖ When**                                                   Click to close

Ensure that you have highlighted a *specific* time that can be used to make any changes; is it easy for other things to take priority in a busy practice.

Pick the most *appropriate* time to implement the changes. For example, if it requires others to help, make sure it isn't during a busy period.

> The senior vets agree to try the new framework. However, the initial timing for implementation was during a week when one of the vets was on holidays and the other was at a continuing education course, and you were busy with the additional work, so you abandoned your plans after the first day.
>
> Thinking strategically about timing for the new framework, you know that in a month's time, a new graduate is joining the practice and will be spending the first week with you on visits, getting to know the clients. The practice diary is being kept quiet to allow the new graduate more time on visits. You think this may be a good time to trial the framework as there will be less time pressure on you, and it will probably be of benefit for the new graduate also.

## ✖ What

Ensure that you are clear as to what you are changing, and what actions are required. It is beneficial to make a note of any changes in order to compare the associated outcomes at a later stage, for example, what was done, the date, dose rates, approaches attempted. You may consider a more formalised framework, such as writing practice guidelines (see below).

Your aim is to get the vets to follow a lameness work-up framework, which will contain the steps they carry out anyway, but perhaps in a slightly different order to how they might have approached these cases previously, with slightly different equipment and consumables.

Communicate the specific details of the suggested changes with the vets and support staff in the practice to make sure everyone is clear about the changes you are suggesting. You could also run an initial pilot where you trial the framework first prior to getting the others involved.

## ✖ How

If possible, plan to implement small incremental changes one at a time, particularly if the changes are required to a number of areas within the practice, to prevent staff feeling overwhelmed by too much change.

Make sure you have everything organised beforehand, for example, the necessary equipment, therapies, resources, people, to make the transition as seamless as possible.

You plan to trial the framework for forelimb lameness to start with. You ask the new graduate shadowing you to feedback on how well the framework works.

With positive feedback on the forelimb lameness framework, you may be in a good position to implement a hindlimb lameness framework in future.

As you consider all the factors which are involved in your strategy for change, it is useful to record any changes you are implementing. This can be done informally, or you may decide to adopt a more formal and evidence-based approach, through producing clinical guidelines. The final and important step in the EBVM cycle is to Assess these changes, covered in the next section.

# 6. Quiz

1. What do 'morbidity and mortality' meetings provide an opportunity for?

○ Apportioning blame for an unfavourable outcome

Incorrect. 'Morbidity and mortality' meetings provide an opportunity to constructively discuss cases with unfavourable outcomes.

○ Constructively discussing cases with unfavourable outcomes

Correct

○ Identifying conditions which are causing high death rates

Incorrect. 'Morbidity and mortality' meetings provide an opportunity to constructively discuss cases with unfavourable outcomes.

○ Identifying and raising awareness of new disease outbreaks

Incorrect. 'Morbidity and mortality' meetings provide an opportunity to constructively discuss cases with unfavourable outcomes.

Check answer     Show answers and explanations

2. What is the benefit of having clinical practice guidelines?

○ Motivating practitioners to trial new ways of approaching a case

Correct. Clear, unambiguous and evidence-based guidelines allow practitioners to make confident choices about using new methods to manage their cases.

○ Providing a rigid set of rules setting out all the steps needed to manage the case

Incorrect. Protocols provide rigid rules; guidelines are more flexible.

○ Practices can decide their preferred way of approaching a case

Incorrect. Guidelines should be evidence-based.

○ Allowing less experienced colleagues to manage complicated cases

Incorrect. Practitioners must be confident with the methods of case management before undertaking them. However, clear, unambiguous and evidence-based guidelines allow practitioners to make confident choices about using new methods to manage their cases.

Check answer     Show answers and explanations

3. When planning to implement changes in order to practice in a more evidence-based way, what is the best approach?

○ Apply all changes at one time to minimise disruption

Incorrect. This can cause a big disruption to the running of the practice, which can be off-putting for clinicians and clients. If possible, plan to implement small incremental changes one at a time, particularly if the changes are required in a number of areas within the clinic/practice.

○ Make a big announcement that the practice is starting to use an evidence-based approach

Incorrect. This will make it sound as though you never used evidence before! Once changes are in place, you can describe your practice as using evidence-based treatment protocols or being an evidence-led practice.

○ Be vague about what will change

Incorrect. Without set goals it will be difficult to motivate change or measure outcomes.

○ Plan to implement small incremental changes one at a time until you have applied them all

Correct. If possible, plan to implement incremental small changes one at a time if the changes are required in a number of areas within the clinic/practice.

[Check answer] [Show answers and explanations]

4. In certain circumstances it is sensible to pilot proposed changes to clinical practice. In this context, what does 'piloting' your changes mean?

○ Managing and guiding vets very closely for the first few months after changes have been made

Incorrect. Micromanaging cases and clinicians is unlikely to win you any friends or be an effective way of assessing change.

○ Rolling the changes out at all branches/for all vets simultaneously

Incorrect. If you wish to pilot a scheme before investing in new equipment/drugs/protocols then you should start small.

○ Announcing your practice as part of a pilot evidence-based veterinary medicine scheme

Incorrect. Evidence-based veterinary medicine is a choice and practices are self-motivated to begin. Announcing it as a pilot scheme suggests you are not currently doing evidence-based veterinary medicine, and it is only intended for personal gain.

○ Asking vets to apply the change as and when they feel necessary

Incorrect. This piecemeal approach will lead to inconsistency, which can be a problem in a multi-vet clinic, and make change difficult to assess.

○ Implementing changes in a few cases initially, and then assessing the impact

Correct. In this way, you can assess the impact of your changes before investing in new equipment or new practice guidelines.

[Check answer] [Show answers and explanations]

5. A senior colleague advises you on the management of a case. You are unsure about their advice as you recently read an article outlining a new treatment with proven benefits. You follow your senior colleague's advice but it makes you feel uncomfortable and anxious. What term describes the way you are feeling?

○ Identity detachment

Incorrect. Identity dissonance describes the anxiety created by acting in a way which does not sit with your goals and values.

○ Identity dissonance

Correct. Identity dissonance describes the anxiety created by acting in a way which does not sit with your goals and values.

○ Conscious bias

Incorrect. Identity dissonance describes the anxiety created by acting in a way which does not sit with your goals and values.

○ Subconscious bias

Incorrect. Identity dissonance describes the anxiety created by acting in a way which does not sit with your goals and values.

[Check answer] [Show answers and explanations]

# 7. Summary

## Learning outcomes

You should now be more familiar with how to:

- use a structured framework to determine whether the evidence is applicable to you, your patients, your environment and the owner

- develop clinical practice guidelines and protocols

- describe ways of communicating evidence to colleagues and clients.

**Now move onto the Assess section** →

# 8. References

Armitage-Chan, E. (2020) Best practice in supporting professional identity formation: Use of a professional reasoning framework. *Journal of Veterinary Medical Education,* 47 (2), pp. 125-136

Armitage-Chan, E. and May, S. (2019). The veterinary identity: A time and context model. *Journal of Veterinary Medical Education,* 46 (2),  pp. 153-162

Bergus, G. et al. (2004) Appraising and applying evidence about a diagnostic test during a performance-based assessment. *BMC Medical Education*, 4:20. Available from: https://doi.org/10.1186/1472-6920-4-20 🔗

Brennan, M.L.  et al. (2020) Critically appraised topics (CATs) in veterinary medicine: Applying evidence in clinical practice. *Frontiers in Veterinary Science* 7:314. Available from: https://doi.org/10.3389/fvets.2020.00314 🔗 [Accessed 16 November 2020]

What is evidence-based veterinary medicine? [Centre for Evidence-based Veterinary Medicine (CEVM)] [online] Available from: https://www.nottingham.ac.uk/cevm/about-the-cevm/evidence-based-veterinary-medicine-(evm).aspx 🔗

Del Mar, C., Doust, J. and Glasziou, P. (2008) *Clinical Thinking: Evidence, Communication and Decision-making*. Oxford: Blackwell Publishing

Fraccaro, E. et al. (2013) A study to compare circulating flunixin, meloxicam and gabapentin concentrations with prostaglandin E2 levels in calves undergoing dehorning. *Research in Veterinary Science*, 95 (1), pp. 204-211. Available from: https://aperto.unito.it/handle/2318/131393#.X64vjmj7RPY 🔗 [Accessed 16 November 2020]

Haley, M. et al. (2012) Implementing evidence in practice: do action lists work? *Education for Primary Care*, 23 (2), pp. 107-114

Heinrich, A. et al. (2010) The effect of meloxicam on behaviour and pain sensitivity of dairy calves following cautery dehorning with a local anaesthetic. J*ournal of Dairy Science*, 93 (6), pp. 2450-2457. Available from: https://doi.org/10.3168/jds.2009-2813 🔗 [Accessed 14 October 2020]

Hewitt-Taylor, J. (2004) Clinical guidelines and care protocols. *Intensive and Critical Care Nursing*, 20 (1), pp. 45-52

Holmes, M. and Cockcroft, P. (2004) Evidence-based veterinary medicine 1. Why is it important and what skills are needed? *In Practice*, 26 (1), pp. 28-33

Johns I.C. and Sweeney, R.W. (2008) Coagulation abnormalities and complications after percutaneous liver biopsy in horses. *Journal of Veterinary Internal Medicine*, 22 (1), pp. 185-189

Kiefe, C. I. et al. (2001) Improving quality improvement using achievable benchmarks for physician feedback: a randomised controlled trial. *Journal of the American Medical Association*, 285 (22), pp. 2871-2879

Legare, F. (2009) Assessing barriers and facilitators to knowledge use. In: Graham, I., Straus, S. and Tetroe, J. *Knowledge Translation in Health Care: Moving from Evidence to Practice*. Oxford: Wiley-Blackwell

Mullan, S. and Fawcett, A. (2017) *Veterinary Ethics: Navigating Tough Cases*. Sheffield, UK: 5M Publishing

Sackett, D. L. and Straus, S. E. (1996) Finding and applying evidence during clinical rounds: the 'evidence cart'. *Journal of the American Medical Association*, 280 (15), pp. 1336-1338

Scott, I. A. and Glasziou, P. P. (2012) Improving effectiveness of clinical medicine: the need for better transition of science into practice. *Medical Journal of Australia*, 197 (7), pp. 374-378

**Now move onto the Assess section** →

# Assess

# Table of contents

# 1. Introduction



**Assess is the final step of the EBVM cycle, evaluating the implementation of evidence into clinical practice.** This step assesses what, if any, impact there has been to patient care or healthcare provision as a result of evidence-based practice. EBVM starts in practice, as the questions should all come from those involved in providing veterinary care (Ask) and the Assess stage ensures EBVM stays in practice.

By the end of this section you will be able to:

- explain why it is important to assess/audit the implementation of EBVM in practice

- describe how to assess/audit EBVM in practice

- use practice examples to demonstrate the use of clinical audit and the assessment of EBVM in practice.

## 2. How can we assess implementation in practice?

**As the final step of the EBVM cycle, Assess involves evaluation of evidence implementation into clinical practice to determine what, if any, impact on the quality of care has occurred as a result of evidence-based practice.**

It is possible to assess implementation of EBVM through a number of formal and informal routes. For example, a formal evaluation of the process or outcomes of healthcare could be achieved through undertaking a clinical audit (see Assess 6).

An informal method of assessment could simply comprise personal reflection on individual cases at the end of a busy day. However, Assess also encompasses evaluation of, or reflection on, how the effectiveness and efficiency of any of the five steps in EBVM could be improved for addressing any future clinical questions. Personal reflection is discussed in more detail in Assess 4.

These assessments can be incorporated into small gaps of time throughout the day (for example, reflecting while having a cup of coffee, or mentally running through the day on your drive home), or specific times can be set aside to actively address individual questions or problems experienced in your daily practice, or by the business as a whole.

Various methods of approaching how you Assess the effect of applying EBVM to practice will be outlined in this section.

# 3. Why do we need to assess?

> **The only way we can establish whether patient care has improved through the application of evidence to practice is to measure the effect of the Apply stage.**

EBVM is a tool to help us improve our clinical practice. To achieve this goal, we need to assess whether the process is helping us in our clinical decision-making in an effective manner. If a practice policy, diagnostic procedure or treatment strategy has changed as a result of finding (Acquire), appraising (Appraise) and applying (Apply) the evidence, it is important to look at the consequences of this change.

Questions to consider:

- How has it affected the patients?
- Did it make any difference?
- Has the quality of care improved or declined?
- Are further changes needed?

It is vital to assess what we do in order to ensure our practice is responding and adapting to the advances in the profession.

# 3.1 Benefits of assessing

**Assessment of EBVM is evaluating the effectiveness of the EBVM process, or the impact of the implementation of new processes, guidelines or protocols, in clinical practice, for the benefit of veterinarians, clients and patients alike.**

The benefits of reflecting on what we are doing and highlighting areas where we can make improvements are far reaching and can range from improved customer satisfaction and patient care, to improved biosecurity practices or financial returns.

The Assess step of EBVM allows us to assess and to uphold professional standards, and offers opportunities to improve the quality and effectiveness of the veterinary services we provide. Assessing also brings benefits beyond improving the quality of patient care including:

- developing a practice philosophy that supports EBVM
- identifying and promoting good practice
- helping to create a culture of quality improvement, within both the practice and the profession
- informing development of local clinical guidelines or protocols (Hewitt-Taylor, 2003)
- providing opportunities for education and training
  - can help to identify requirements for further training/CPD (Moore and Klingborg, 2003)
- facilitating better use of practice resources
- helping to improve client communication
- building relationships between practice team members
- providing opportunities for increased job satisfaction

Another important outcome of assessment is the identification of areas where there are deficits in the evidence base, as well as the potential to identify actions we might undertake to help address those deficits.

## 3.2 Assess as part of clinical governance

> **A principal reason for assessing implementation of EBVM is as part of a clinical governance programme.**

Clinical governance provides a comprehensive framework, including a number of different quality improvement systems ⧉ (such as clinical audit, supporting and applying evidence-based practice, implementing clinical standards and guidelines, and workforce development) and promotes an integrated approach towards continuous quality improvement.

### Figure 5: Measuring and improving our quality of care



For example, as can be seen in Figure 5 above, significant event audits might lead to the creation of checklists, guidelines and protocols, and the topic of a significant event audit may suggest an area for a clinical audit. The results of a clinical audit may lead to the creation of guidelines and protocols, and checklists, and the impact of these can also be measured by a clinical audit. A clinical audit might produce a figure for use in benchmarking. Benchmarking results might be improved by implementing guidelines and protocols, and checklists.

The RCVS Code of Professional Conduct for Veterinary Surgeons ⧉ defines clinical governance as:

> a continuing process of reflection, analysis and improvement in professional practice for the benefit of the animal patient and the client owner.

In the UK, the RCVS Practice Standards Scheme ⧉ states that:

> The practice must have a system in place for monitoring and discussing clinical cases, analysing and continually improving professional practice as a result.

and that:

> Veterinary surgeons must ensure that clinical governance forms part of their professional activities.

Veterinary Hospitals in the UK must also comply with the following:

> Regular morbidity and mortality meetings must be held to discuss the outcome of clinical cases. There are records of meetings and changes in procedures as a consequence.

and:

> Clinical procedures carried out in the practice are audited and any changes implemented as a result.

But it's not just abiding by professional standards that drives us to assess what we do. Development of an ethos of reflection on, and assessment of, our practices is a vital part of developing our confidence and competence as a veterinary professional.

# 4. Reflection as a quality improvement tool

> **At its simplest level, we can use reflection to assess clinical outcomes – either as an individual or as a group (for example, during clinical rounds).**

We often only reflect on the cases where something went wrong or we had an unexpected outcome. However, any decision can benefit from reflection *(Koshy et al., 2017)* – whether it is implementation of a well-researched new treatment, diagnostic or biosecurity protocol or simply reflection on a series of cases that were managed in a particular way in order to better understand how that management might be improved. If we don't reflect on what we are doing, our practices may remain stagnant and become rapidly outdated.

Reflection and unstructured EBVM is simple and easy to incorporate into everyday practice, but it is important to try to still follow the EBVM cycle. Reflection without support of the literature or without a clear question can lead to a vague outcome. Referring to the literature as part of your reflection allows you to utilise the entire EBVM cycle: Asking the correct question, Acquiring and Appraising the evidence, Applying that information and then finally Assessing if the application was appropriate. Reflecting about how you navigated the five stages of the EBVM cycle also offers a simple way of assessing your own performance as an EBVM practitioner.

While it may require some additional planning and time management compared to personal reflection, team-based reflection can be a very useful quality improvement tool *(Shaw et al., 2012)*.

---

🔖 Example Scenario

### Postoperative physiotherapy

During monthly clinical rounds in a busy small animal practice, Sam reported that his last case of cranial cruciate ligament (CCL) rupture had re-presented with rupture of the CCL in the contralateral limb three months after surgery.

On presentation, Sam had noticed that the dog was not using the limb he had initially operated on fully, and suspected poor return to function of the operated limb had been a contributing factor. The owner was upset because when she had anterior cruciate ligament surgery herself, she had received an intensive programme of physiotherapy postoperatively, and wondered if the lack of physiotherapy could have been a factor in her dog's new CCL injury.

One of Sam's colleagues, Nicky, could recall similar cases in the practice and remembered reading a paper about early intensive physiotherapy used postoperatively after CCL surgery in dogs. Sam and Nicky worked together in an informal EBVM cycle of reflection, asking the question 'In dogs with CCL injury, does postoperative physiotherapy compared to our traditionally prescribed controlled exercise programme improve function in the operated limb?'.



They identified a small number of papers that supported this approach, and although the evidence was not based on large multicentre trials in dogs, they felt there was sufficient evidence to apply physiotherapy as part of the postoperative management plan.

Together they found a local animal-qualified physiotherapist and implemented a new practice guideline for referral of all CCL cases for postoperative physiotherapy, starting with Sam's patient following its second surgery.

The head nurse was involved with keeping a record of the cases of contralateral limb CCL rupture, as well as documenting client feedback on the physiotherapy, all of which were scheduled to be reviewed in a meeting in 12 months' time.

## Key points:

- This example shows a simple use of EBVM to address a problem following reflection on a case (although it could equally have been used pro-actively before a problem arose).

- A question was asked, information was acquired and appraised (albeit relatively informally), and the veterinarians applied the information in developing a new management guideline for dogs with CCL injury.

- In order to ensure that this new management protocol is actually doing what the veterinarians hope it will do, it is essential that they also implement a system to assess the response against clear outcome measures. In this case the outcomes are:

  1. the number of cases presenting for contralateral limb CCL injury.
  2. client feedback on the postoperative management guideline.

- A realistic time frame was set in order to ensure the guideline could be appropriately evaluated.

# 5. Clinical audit as a quality improvement tool

**Clinical audit can help with assessing the implementation of EBVM in practice, for personal and practice-level professional improvement.**

Clinical audit is:

> a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit measures and the implementation of change. (NICE, 2002)
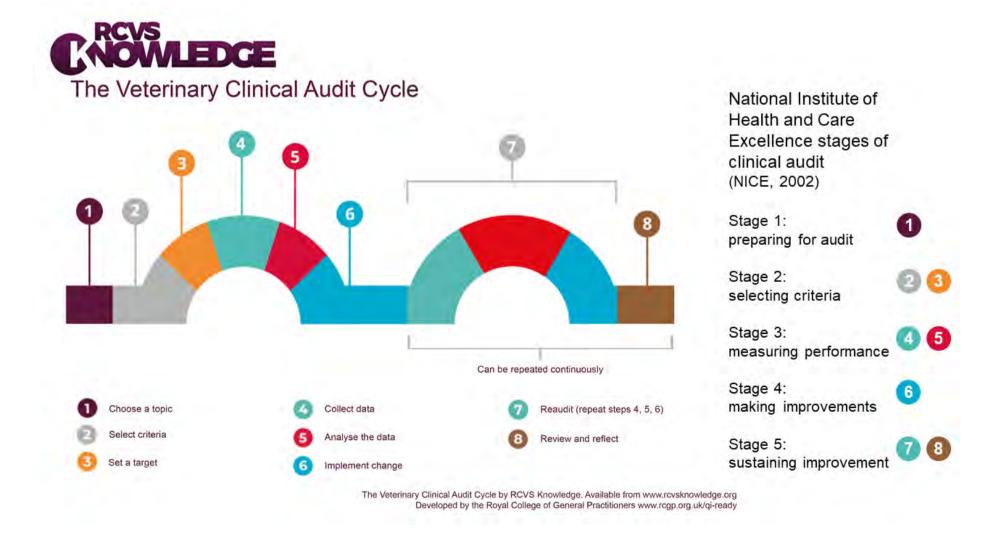
Brief introductions to key elements of the stages of the clinical audit cycle are outlined in this chapter. For a more comprehensive overview, RCVS Knowledge has collated a wide range of quality improvement resources ☒, including an e-learning course on clinical audit ☒ and a short summary infographic about the stages of clinical audit ☒.

## The key components of clinical audit are:

- measurement (measuring a specific element of clinical practice)
- comparison (comparing results with the recognised standard)
- evaluation (reflecting on the outcome of an audit and where indicated, changing practice accordingly).

Figure 6 below shows the eight-stage clinical audit cycle from RCVS Knowledge ☒, together with how these stages align with the commonly-used five-stage audit cycle defined by the National Institute of Health and Care Excellence (NICE, 2002).

## Figure 6: The veterinary clinical audit cycle



The Veterinary Clinical Audit Cycle by RCVS Knowledge. Available from www.rcvsknowledge.org
Developed by the Royal College of General Practitioners www.rcgp.org.uk/qi-ready

The eight stages in the veterinary clinical audit cycle are listed in Figure 6 above, alongside related stages in the NICE five-stage audit cycle:

1. Choose a topic (Stage 1 of NICE audit cycle 'Preparing for audit')

2. Select criteria

3. Set a target (Stages 2 and 3 relate to Stage 2 of NICE audit cycle 'Selecting criteria')

4. Collect data

5. Analyse the data (Stages 4 and 5 relate to Stage 3 of NICE audit cycle 'Measuring performance')

6. Implement change (Stage 4 of NICE audit cycle 'Making improvements')

7. Reaudit (repeat steps 4, 5 and 6)

8. Review and reflect (Stages 7 and 8 relate to Stage 5 of NICE audit cycle 'Sustaining improvement')

---

**Audit and research are different, although there can be overlap, and audits have potential to identify where further research is needed.**

---

> Research is concerned with discovering the right thing to do whereas audit is intended to make sure that the *thing is done right*. (Smith, 1992)

Table 11 on the following page describes the differences between clinical audit and research.

Other articles on clinical audit including some comparisons with research include: Viner (2009); Wylie (2015); Waine & Brennan (2015) and Waine et al. (2018a, 2018b).

## Table 11: Differences between clinical audit and research

| | Clinical Audit | Research |
|---|---|---|
| **Purpose** | To improve health care service: audits are designed and conducted to produce information to inform delivery of best care. | To improve knowledge: research studies are designed and conducted to derive generalisable new knowledge and to generate or test hypotheses. |
| **Questions** | How close is current practice to best practice? Does this service reach a predetermined standard? Are we doing the right thing and are we doing it the best way? Are we actually doing what we think we are doing? | What is best practice? What is the right thing to do and what is the best way to do it? |
| **Knowledge generated** | Provides knowledge primarily about the service being audited. | Provides knowledge about relationships between events and (possible) cause/s. |
| **Aims/objectives** | Measure current practice against defined criteria/standard(s). | Addresses clearly defined questions, aims and objectives. |
| **Time frame** | An on-going process. | Often a one-off project. |
| **Sample size** | Smaller, pragmatically based sample size. | Based on scientifically valid sample size (except some pilot studies). |
| **Patients** | Patients continue to experience normal treatment/management. Little disturbance to patients/owners. | May involve experiments on patients. May be extra disturbance to patients/owners. |
| **Study design** | No randomisation/allocation to intervention groups: the health care professional and owner have chosen intervention before clinical audit. | Study design may involve randomisation/allocating patients to intervention groups. |
| **Methods** | Involves an intervention in use ONLY (the choice of treatment is that of the clinician and owner according to guidance, professional standards and/or client preference) Never involves a placebo. | Quantitative research – may involve evaluating or comparing interventions, particularly new ones. Qualitative research – usually involves studying how interventions are experienced. |
| **Data collection** | Usually involves analysis of existing data but may include administration of simple interview or questionnaire. | Usually involves collecting data that are additional to those for routine care but may include data collected routinely. May involve treatments, samples or investigations additional to routine care. |
| **Data analysis** | Generally basic summary/descriptive statistics. | Extensive statistical analysis of data is routine. Data analysis methods vary depending on qualitative versus quantitative research. |
| **Results** | Specific and local to one patient group therefore not generalisable (although the audit process may be of interest to a wider audience). | Studies should be designed to be replicable and results may be generalisable. |
| **Impact** | Findings influence activities of an individual practice, or individuals within a practice. | Findings may influence the activities of clinical practice as a whole. |

# 6. Clinical audit in the veterinary world

**Clinical audit is a well-established and widely used quality improvement tool in human health care, and there is a huge wealth of available resources regarding audit methodology, which can readily be adapted for use in veterinary settings. However, there are some key differences we should consider when embarking on a veterinary clinical audit.**

Criteria-based (or standards-based) audits are the most common type of clinical audit undertaken in human health care, where high quality clinical guidelines are the preferred source for deriving audit criteria from evidence (NICE, 2002). One thing to be very careful about in comparing the audit process in veterinary medicine to the audit process in human medicine, is that there are many fewer clinical guidelines available in veterinary medicine ⬀. Therefore, in many situations, we need to rely on developing our own evidence-based criteria (Mair, 2006) .

Another key difference in human health care is the provision of protected time allocated for doctors to undertake medical audit activities (National Health Service (NHS) White Paper *Working for Patients, 1989*). This may not be feasible within a busy veterinary practice setting, and therefore careful planning is required to ensure completion of a successful audit project, including particular attention to selecting the right audit team, setting clear and achievable audit objectives and methods for data collection. All these considerations are discussed more fully on the following pages.

As well as the quality of care we provide for our patients, we must also recognise the importance of animal owners as veterinary service users. In addition to patient-centred outcomes, veterinary clinical audit can be used to evaluate the care delivered from the client's perspective, for example through assessing client satisfaction with a new treatment or procedure.

# 6.1 Where to start in clinical audit

> **Like most things in life, clinical audit is best learnt through practical experience. It is better to gain this experience with small, simple projects that are narrowly focused rather than attempting to do everything all at once.**

## Choosing an area to audit

The overarching aim of clinical audit is to improve the quality of care, therefore try to choose an audit topic that offers realistic potential to lead to measurable improvements for patients, clients or the practice team.

Start with something that:

- occurs relatively frequently, or is of significance when it does occur

- has a clearly defined outcome or is clearly measurable

- is a priority or a topical issue for you or your practice

- you care about (or believe that some stakeholders care about)

- is in an area in which change is possible, should findings of the audit identify that some improvement is required

Good areas for a first audit are:

- re-audit of a clinical audit topic previously carried out by colleagues/peers

- suspected nosocomial infections

- compliance with a protocol or guideline

- peri-operative deaths

- postoperative complications for common elective surgeries (e.g. [neutering ↗](#)).

## Types of clinical audit

---

**✖ Criteria-based (or standards-based) audit**  Click to close

This is a clinical audit which seeks to improve services through comparing current practice against a standard that has already been set by examining:

- whether or not what ought to be happening is happening

- whether current practice meets required standards

- whether current practice follows published guidelines

- whether clinical practice is applying the knowledge that has been gained through research

- whether current evidence is being applied in a given situation.

---

**✖ Significant event audit**  Click to close

Significant event audit ↗ (Mosedale, 2017) is defined as:

> 66 an event thought by anyone in the team to be significant in the care of patients or the conduct of the practice (Pringle et al.,1995)

---

Responding appropriately to findings from incidents, errors and near misses is an essential element of quality improvement.

## What can be audited?

Any aspect of the structure, process or outcome of health care can be evaluated in a clinical audit (NICE, 2002).

---

**✖  Structure audit**                                          Click to close

- related to the organisation or provision of services
  - staff and resources that enable healthcare
  - environment in which care is delivered
  - facilities/equipment
  - documentation of policies/procedures/protocols

### Practical examples of structure audits

Structure audits evaluate environmental factors within which health care is delivered, and can provide an indirect assessment of a patient's care. An example of a structure audit is auditing whether the right equipment and team members are available when planning a new procedure in the practice (for instance, a laparoscopic spay). A structure audit for an ambulatory practice could be auditing which equipment is carried in different vets' cars.

---

**✖  Process audit**                                            Click to close

- related to procedures and practices implemented by staff in the prescription, delivery and evaluation of care
  - diagnostic investigations, treatments, procedures
- may be specific to the clinical process or to service/administrative processes

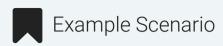### Practical examples of process audits

Process measures may include communication, assessment, education, investigations, prescribing, surgical or medical interventions, evaluation, and documentation (NICE, 2002). Process audits provide a more direct measure of the quality of care, and examples include: appropriate prescribing of fluoroquinolones (Dunn and Dunn, 2012), evaluating the number of equine laminitis cases that undergo laboratory testing for an underlying endocrine disorder, or assessing practice processes for patient discharge following hospitalisation.

---

**✖  Outcome audit**                                            Click to close

- related to any outcome following delivery of care (i.e. not solely limited to patient outcomes)
  - physical or behavioural response to an intervention
  - measurable change in health or survival status
- outcome measures can be:
  - desirable e.g. improvement in the patient's condition or quality of life
  - undesirable e.g. adverse effects of a treatment
- measuring the views of those who use services (e.g. level of knowledge or satisfaction) enables assessment of the care delivered from the client's perspective e.g. client satisfaction

### Practical examples of outcome audits

Outcomes are not a direct measure of the care provided, and not all patients who experience substandard care will have a poor outcome; however outcome audits are the most frequently performed type of audit in veterinary medicine (Rose et al., 2016a). Examples of outcome audits include evaluation of postoperative complications following tibial tuberosity advancement surgery (Proot and Corr, 2013), evaluation of canine quality of life following medical treatment of osteoarthritis, reduction in adrenocorticotropic hormone (ACTH) in horses diagnosed with pituitary pars intermedia dysfunction (PPID) following treatment with pergolide, or evaluating client satisfaction with the practice's new weight management clinic for obese dogs.

## Small animal dental imaging

Tom has just recently performed a Knowledge Summary for his practice, which demonstrated that high definition computed radiography in dogs and cats has superior diagnostic capability for periodontal disease compared to visual examination.

On the basis of this evidence, and because of the potential to improve animal welfare by reducing additional visits or prolonged morbidity associated with undiagnosed disease, the partners have just invested in dental radiography. In accordance with available dental care guidelines (Bellows et al., 2019), Tom's practice recommended survey intraoral radiographs for all dogs and cats presented for dental treatment, with subsequent extraction of any diseased teeth identified.

Tom now wants to establish and demonstrate to the partners (practice owners) that this has been a good investment and that it has improved animal welfare. A practice meeting is held to discuss how best to assess their new radiography system. The partners are keen to discover the cost-effectiveness of their equipment purchase, but everyone agrees that client feedback would be a useful measure of clinical benefit. Therefore, Tom plans an outcome clinical audit, evaluating owner-reported improvement in health-related quality of life following dental treatment.

**Key points:**

This is an example of an outcome audit, using client feedback to evaluate the quality of care following practice investment in new equipment for dental radiography.

Tom selected his audit topic as it was an important area for his practice, and of considerable interest to him personally.

## 6.2 Making sure clinical audit gets done – the administrative side

**A clinical audit team should include representatives from all groups involved in delivering veterinary care. All members of a practice team can lead or make a valuable contribution to audits, depending on the area being audited.**

The auditing process is not a light undertaking, and lack of time and resources are frequently reported as the main barriers to undertaking clinical audit in human medicine. Administrative colleagues in a practice team are a source of valuable knowledge and expertise, as they have extensive experience that can be used to help smooth the process and make sure all the practicalities of the audit have been addressed.

Specific points to be addressed include:

- Are there any team members with previous experience of clinical audit available to help with training colleagues?

- Who within the practice will be responsible for collecting the data?

- Are the data required for the audit collected routinely in electronic clinical records, case notes or databases?

- Does an appropriate recording system exist in the practice (e.g. is a paper-based system most appropriate? How feasible is extracting the required data from the current practice computer-based system?)

- Who will analyse the audit data?

- Are the data collected for the audit fit for purpose?

- With what will you compare the results you generate?

- How will you disseminate the results, both within and outside the practice?

# 6.3 Setting audit aims and objectives

A clinical audit with no clear purpose will deliver little or no improvement to the quality and effectiveness of clinical care. Clearly stated aims and objectives specify the purpose and scope of the audit, and provide a basis for keeping the audit focused.

Remember the primary goal of clinical audit is quality improvement, so this should be reflected in your audit aims.

Aims are broad, simple statements that describe what you want to achieve.

Ideally, audit aims should include verbs such as: improve, increase, enhance, ensure or change (Buttery, 1998), which convey the intention to measure current practice and identify where improvement may be needed.

✖ **Practical example**                                                                 Click to close

An audit of **surgical safety checklists** ⬈ might have as its overall aim: 'To improve adherence with completion of surgical safety checklists for all surgical procedures performed under general anaesthesia'

Audit objectives are more detailed statements that are used to describe the different aspects of quality which will be measured to show how the aim of the clinical audit will be met.

Therefore audit objectives should contain a verb to describe what you want to do, the intervention or service you are evaluating and an aspect of quality related to that intervention or service (Maxwell, 1992 ).

✖ **Practical example**                                                                 Click to close
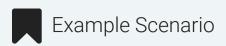
An audit of **surgical safety checklists** ⬈ might have specific objectives: 'To increase the number of surgical cases for which a completed surgical safety checklist is included within the patient's clinical records' and 'To ensure the content of the surgical safety checklist provides an accurate record of pre-induction, intra-operative and post-surgical checks carried out'

## Example Scenario

### Completion of financial consent forms

At Matthew's veterinary hospital, owners are required to complete two consent forms: one for the treatment/procedure and one that records any estimate provided and obtains financial consent for the procedures to be performed. After a client complaint regarding the cost of treatment, the administrative members of the team report that the financial consent form had not been completed at the time of admission for this case.

Matthew plans a process clinical audit, to quantify and improve the rate of consent form completion at his hospital.

His audit aim is "to improve the completion rate of financial consent forms for patients admitted to the hospital".

He sets specific objectives: "to ensure all consent forms are filled in at admission by reception team members or clinicians with a procedure and financial estimate" and "to ensure all financial consent forms are signed by owners to serve as a written record of them having provided informed consent and agreeance to the financial estimate provided".

# 6.4 Defining audit criteria/standards

**The terms 'criteria' and 'standards' often lead to confusion as these terms have been used differently by various professional groups and writers across healthcare, and are frequently used interchangeably.**

Audit criteria are clearly defined, measurable, explicit statements, which are used to assess the quality of care.

For criteria to be valid and lead to improvements in care, they need to be:

- evidence-based

- related to important aspects of care

- measurable (NICE, 2002)

The National Institute of Health and Care Excellence recommends using high quality clinical practice guidelines to develop audit criteria (NICE, 2002). There are several different appraisal tools available to help you evaluate the quality of clinical guidelines (for example, the AGREE II checklist ☐ developed by the AGREE Collaboration; see also Siering et al., 2013). These appraisal tools can be utilised to determine whether or not guidelines represent a suitable source for deriving your audit criteria. However, published clinical guidelines are scarce in veterinary medicine, with professional consensus statements ☐ offering the closest available option in many cases.

If clinical guidelines or up-to-date systematic reviews are not available, a literature review may be carried out to identify (Acquire) the best (Appraise) and most up-to-date evidence from which audit criteria may be generated.

You may already have evidence-based clinical protocols or guidelines for your practice, which you can use to define 'local' audit criteria. Where there are no known or available criteria, one other option is to compare your audit data to historical clinical records over time.

Each audit criterion should have a performance level or target assigned to it (usually expressed as a percentage). Again, some overlap and confusion exists between different publications and guidance about clinical audit – some sources use the term 'standard' to define the performance level or target for expected compliance.

## A structure audit evaluating practice waiting times:

| Criterion | Target/performance level |
|---|---|
| All patients should be seen within 15 minutes of appointment time | 90% |

## A process audit of equine laminitis:

| Criterion | Target/performance level |
|---|---|
| All equids diagnosed with acute laminitis, with no clinical signs of systemic illness (such as systemic inflammatory response syndrome (SIRS)), should receive a follow-up appointment for endocrine laboratory testing | 100% |

## An outcome audit of perioperative hypothermia management:

| Criterion | Target/performance level |
|---|---|
| All dogs with postoperative hypothermia should have rectal temperature measured hourly during recovery until a temperature of ≥37·5°C is reached (adapted from Rose *et al.*, 2016b) | 100% |

In many cases, we would aim to achieve 100% compliance with our evidence-based 'best practice', as set out by our audit criteria. However in practice, performance levels are a compromise between clinical importance, practicability and acceptability and for various reasons, it may not always be possible to meet 100% compliance.

Where you have set your target performance level based on published literature, you should note that levels of performance achieved in trials or research studies are helpful, but they often include very well defined study populations and should not be regarded as uniformly achievable in unselected patient populations in a practice setting. Clinical practice benchmarking 🗗 can also be used to set and maintain target levels of performance.

There may be justifiable reasons why some cases might not comply with a specific audit criterion, and these cases should not be included in your audit data analysis. These exceptions should be defined along with your audit criteria, prior to data collection.

## Example Scenario

### Small animal dental imaging

Although published practice guidelines emphasise the importance of dental health in canine and feline quality of life (Bellows et al., 2019), Tom was unable to identify evidence to help him set the criteria and target performance level for his audit. The practice team agree on a criterion of owner-reported improvement following dental treatment. Tom found a systematic review of oral health-related quality of life following dental treatment under general anaesthesia in children (Knapp et al., 2017). Considering this to be a useful proxy for owner assessment of quality of life in his patients, Tom uses data from studies included in this review for his audit. Tom sets a target performance level of 65% of dental cases being reported to have improved quality of life following treatment, based on 63% of children having met or exceeded a minimal clinically important difference in quality of life following dental treatment (Knapp et al., 2017).

> **Key point:**
>
> In the absence of species-specific evidence to set his target performance level, Tom utilised comparative information from a systematic review of a similar area in human medicine.

## Example Scenario

### Completion of financial consent forms

The criteria for Matthew's audit were defined by local consensus as:

1) the percentage of financial consent forms with the estimate filled in

2) the percentage of financial consent forms with the owner or owner representative's signature

> **Key point:**
>
> Matthew's audit team agree that the target performance level for each process criterion should be set at 100% based on guidance provided by the RCVS that informed consent and documentation of consent is essential. The team agreed that emergency cases brought in by a transporter only, with no owner or representative present, would be excluded from the clinical audit (exceptions to the audit criteria).

# 6.5 Measuring performance – data collection and analysis

> **EBVM includes patient, client, experiential and practice factors as well as the peer-reviewed scientific literature, and all of these will influence the information you gain and want to gain from a clinical audit.**

For example, you might want to know if implementation of a protocol or new treatment has improved client satisfaction, decreased costs to the client, increased profit margins, saved time, improved veterinary compliance, reduced side effects, increased survival, or increased quality of life. In order to answer this 'What if?', you need to ensure you are asking the right questions to the right person (e.g. quality of life is often best evaluated by owners through practical questions involving the animal's daily life, not by their veterinarian).

Your audit aims and objectives should be the primary consideration when deciding which data you will need to collect for your audit. You should only collect data required to show whether or not performance levels have been met for each criterion – collecting additional data provides little or no benefit, and is more time consuming.

## When planning data collection for your audit, there are several aspects you should consider in advance, including:

- what data collection strategy is most likely to result in complete and reliable data?
- audit population
  - what inclusion or exclusion criteria would you use to identify suitable cases for the audit?
  - how many cases will you need to include?
  - over what time period would you need to collect data?
- will you collect prospective or retrospective data?
- what data source(s) will you use?
  - is all the information you require routinely recorded on electronic clinical records?
- will you need to design a data collection tool? (example in Waine et al. 2018b)

---

🔖 Example Scenario:

### Small animal dental imaging

Tom's audit sample includes all dogs and cats receiving dentals within the 12 months following installation of the computed radiography system. Tom extracted the total cost per dental visit from clinical records. His trainee vet nurse has designed an owner feedback questionnaire (including key questions about overall demeanour, eating behaviour and halitosis, and quality of life) as part of her nursing degree course.

> **Key point:**
>
> The audit team included the veterinary nurse, making use of her expertise to design and administer the owner questionnaire for audit data collection.

The first step is often to develop ways to obtain data that will help you assess what you are doing in your practice, so don't worry if the first attempt at data collection isn't successful. If you discover you need more data, try to implement changes that will make things better on the next attempt.

Data collection is only part of the process of measuring performance, and once you have collected your audit data, you need to determine what data analyses to undertake. Remember that the focus of data analysis for clinical audit is to convert a collection of data into useful information in order to identify the level of compliance with your agreed target/performance level. A common pitfall is the temptation to over-analyse or over-interpret the data that are obtained. Data analysis should be kept as simple as possible – if you are using hypothesis tests or advanced statistical methods, you are very likely to be answering a research question, not undertaking a clinical audit.

Most audits will involve calculating some basic summary/descriptive statistics (such as means or medians, and percentages). Simply calculating the percentage of your audit cases that complied with your criteria will allow you to decide if your results show that the changes you have made are as good as, or better than, your defined target performance level(s).

## Some examples of ways in which we could monitor changes against criteria might be:

- Making sure that recurrence or complication rates for a specific disorder are equivalent to a recent multicentre case series found in the literature.

- Setting nosocomial infection rates to reduce by a certain percentage from the current baseline if no history of actual rates is available.

- Insisting that client-reported quality of life or pain score ratings should be equivalent to published results, should improve from what they currently are in your clinic, or should be greater than a predefined percentage.

- Necessitating that client satisfaction should improve, or remain static where it has already been at high levels.

- Requiring veterinary or owner compliance to be above a certain cut-off percentage (e.g. veterinary adherence to safety protocols would be expected to be 100%, while expectations of client compliance to puppy vaccination schedules may be set slightly lower).

- Stipulating that cost implications of implementing a new protocol should be comparable to those associated with the previous protocol, or that the new protocol will have a demonstrable cost benefit to the client and/or practice.

---

🔖 Example Scenario:

### Small animal dental imaging

Over the year following implementation of dental radiography, there was a 20% increase in total extractions, which was consistent with radiography identifying additional diseased teeth in dogs and cats. The average dental invoice increased by 36%, providing a noticeable increase in gross income. No client queried the bill (although a practice policy of providing clear estimates for dental work had been instituted concurrently).

During the period of the audit there were 95 responses to the animal welfare questionnaire: 60 from dog owners and 35 from cat owners. 85% of dog owners indicated a positive response, with dogs showing increased activity levels ('acting years younger') and/or owners reporting reduced halitosis. Only 60% of cat owners indicated a positive response, with changes mentioned primarily associated with improved appetite. There were no reports of deterioration in health or quality of life, however the remaining 40% of respondents that indicated that they did not notice any particular response to dental treatment in their pets. Overall, 76% of owners reported significant improvement in their animal's wellbeing following dental treatment; however, owner-reported outcome for cats fell just below Tom's target performance level of 65%.

**Key point:**

Data analysis for Tom's clinical audit required simple calculation of the percentage of dental cases meeting the audit criterion of improved owner-reported health-related quality of life following treatment.

# 6.6 Drawing conclusions and making changes

**Once you have the results, it is time to act on them! If you started off by establishing criteria by which you will assess your current practice, then it is a simple matter of comparing your results with those criteria, and reporting your results to the practice team.**

In many cases, the audit process may well indicate that no change is required. For example, an audit of peri-operative fatalities, or post-surgical wound breakdowns/infections, may indicate that rates have not changed recently and that they remain at levels that are similar to those in other clinics. The point of clinical audit is that it provides baseline data or reference points for comparison. Clinical audit also ensures that a process is in place that will likely result in early identification if things start to go wrong.

Alternatively, your data analysis and interpretation might identify some clinical areas that should be addressed (e.g. areas for improvements in care/performance/service provision etc.). You should use your findings to inform ways of improving, which should be the basis of the recommendations of your audit. These recommendations can be used to develop a realistic and achievable action plan, specifying what needs to be done, how it will be done, who is going to do it and by when. Implementing changes that will improve areas of poorer performance is often the hardest part of any audit.

## 🔖 Example Scenario:

### Small animal dental imaging

The implementation of dental radiography was considered beneficial from both an animal welfare and financial aspect, and client feedback was good, despite the increased cost. As the proportion of cats with an owner-reported improvement was lower than desired, Tom's practice decided to utilise the dental guidelines to implement a new practice protocol for discharge appointments for feline patients after dental treatment, where the vet or head nurse would show owners their cat's dental chart and radiographs, and a follow-up appointment in 10–14 days would be booked. The practice also decided to continue to monitor client feedback, dental invoices and the numbers of extractions they perform, with a view to reviewing the data again in 12 months' time.

> **Key point:**
>
> A realistic time frame was set for re-audit in order to ensure the changes implemented to improve outcomes in feline patients could be appropriately evaluated.

> **■ Example Scenario:**
>
> ## Completion of financial consent forms
>
> Matthew collected audit data for the previous 100 consecutive hospital admissions, and found that while treatment/procedure consent forms were completed for 99% of cases, completion rates for financial consent forms were considerably lower. Only 57% of financial consent forms included a written estimate and 56% were signed by the owner or representative.
>
> Further analysis shows that financial consent forms were completed for 95% of cases admitted out-of-hours, but for only 46% of cases admitted during normal working hours. He identified that completion of consent forms for out-patient cases was lower than for in-patient cases. Matthew used process mapping as part of his root cause analysis to develop an understanding of the reasons why the performance level for completion of financial consent forms was not being reached. This involves mapping out each step of a process in sequence so that areas for improvement can be identified. As a result of this, the audit team determined that the time of admission would be the easiest point to obtain financial consent, and that vets were best suited to discuss financial estimates and consent with clients. Matthew recognised that a better understanding of the consent process from an owner's perspective could help to inform future improvements (Whiting et al., 2017).
>
> Matthew presented his audit findings at a hospital team meeting, including his recommendation that a change of policy should be implemented, where the vet admitting the patient would be responsible for discussing financial costs and obtaining financial consent from the client.  Matthew plans to re-audit in six months, including collecting data regarding owners' opinions of the consent process.

# 6.7 Acting on the results of clinical audit – sustaining improvements

> As we become more proactive in EBVM, we may go further than identifying areas requiring improvement and be able to proactively establish a system to regularly (continuously or periodically) assess outcomes. We can then use that information to review our treatments, protocols and procedures, for the betterment of ourselves and our veterinary patients.

The overarching principle to successful implementation and adoption of both EBVM and clinical audit is to keep things small and simple, especially to start off with. It should be possible for you to set a modest goal of clear benefit, and to achieve it. Communication is also important – be sure you keep records of the process and of your findings so that you can compare the next cycle with the last. Discuss the tasks and progress with colleagues both during and after each audit cycle. Good communication will help to involve the more experienced (and often busiest) members of the practice who may at first be reluctant or unable to engage otherwise.

While the primary goal of clinical audit is improving performance, sustaining that improvement is also essential. The audit cycle is a continuous process, and requires re-auditing to 'close the loop'. Re-audit is central to both assessing and maintaining the improvements made during clinical audit. The same methods for sample selection, data collection and analysis should be used to ensure that the data are valid and comparable with the results from previous audit(s).

Part of the audit process should be for you and your colleagues to identify thresholds that might trigger you to further action. That action might involve further in-depth investigation, or it may involve an increased frequency of the audit cycle to see if preliminary results are indeed a trend in the wrong direction, or just an anomaly that should be monitored but perhaps not acted on at this time. On the whole, a common sense approach is required. However, an explicit and systematic process can help veterinary practices avoid falling into complacency or inertia.

Where an initial audit demonstrates that desired performance levels are not being reached and an action plan has been put in place, the audit should then be repeated to show whether the changes implemented have improved care or whether further changes are required. This cycle is repeated until the desired standards are being achieved. Where the initial audit showed that no changes or improvements were required, re-auditing allows you to ensure that the high standards of care are being maintained.

Sustainable improvements in quality of care are going to be more readily achieved where everyone in the practice (or profession) is aware, and supportive, of planned audit activity. In addition to fostering a culture of continuous improvement, longer term success may require practice development; for example, there may be a requirement for training or organisational changes, such as modifying format, content or quality of clinical records, updating or changing practice management software or time allocation for team members involved in clinical audit to gather and analyse.

> The reading material in the next section 'Beyond clinical audit – alternative ways to assess' is additional. You might find it useful to deepen your understanding.

# 7. Beyond clinical audit – alternative ways to assess

**While clinical audit remains the most widely used methodology in human health care, there are a number of other quality improvement tools that you can use to assess.**

Traditional clinical audit is a formal way to find out if the care we are providing is in line with recognised standards, but there are a large number of other quality improvement tools that you can use to Assess (Hughes, 2008). Examples of some of these alternative methods are outlined below.

---

✖ **Plan-do-study-act**                                            Click to close

Plan-do-study-act (PDSA) methodology (Taylor et al., 2013) is a simple form of cyclical assessment of practice, which can be used to drive small steps of change in practice at a local level. The PDSA is a small, rapid cycle designed to test, measure impact and test again. It allows users to design the process so that it makes their life easier, while retaining the quality improvement effect.

**Plan:** identify a change aimed at improving quality of care and develop a plan to test the change

**Do:** test the effect of this change

**Study:** observe, analyse and learn from the test to evaluate the success of the change, or identify anything that went wrong

**Act:** adopt the change if it was entirely successful, or identify any modifications required to inform a new PDSA cycle

---

🔖 **Clinical Scenario**

### Small animal resuscitation

Bella, an 8-month-old lurcher, had fracture fixation surgery but she did not regain normal limb function and follow-up radiographs showed non-union, therefore amputation of the limb was determined to be the best treatment option. During limb amputation surgery, Bella went in to cardiopulmonary arrest. Unfortunately, the locum nurse struggled to find the drugs required by the anaesthetist for advanced life support, and Bella died despite cardiopulmonary resuscitation (CPR).

Head nurse Lynne realises that implementing resuscitation training for all staff could help reduce the risk of this happening in the future (PLAN). Lynne reviews available guidelines (Fletcher et al., 2012) and together with the anaesthetist, she prepares a short lecture regarding CPR to provide in-house training for all nursing staff. She also organises an induction for all new staff, to ensure that they know the location of the resuscitation trolley in theatre, and that they are familiar with the layout and contents of the resuscitation trolley (DO). Lynne informally assesses the benefit of her training and induction by setting a basic quiz for nursing staff to take afterwards. The training is well received and the nurses perform well in the quiz, however since cardiopulmonary arrest thankfully happens very rarely in their practice, some of the nurses are concerned that they may not remember everything they have learned in the future. They also highlight that for some surgeries, interns are more frequently involved in assisting the anaesthetist than nurses (STUDY). Lynne realises that all clinical staff in the practice (vets, nurses and veterinary care assistants) should receive the CPR training and resuscitation trolley induction, and that including some practical skills training should improve learning and knowledge retention. She also devised a more structured assessment for staff after CPR training, and creates an emergency drug list with a dosing chart, which is kept with the drugs in the resuscitation trolley (ACT).

Lynne plans to provide refresher training to all staff every six months, based on available guidelines (Fletcher et al., 2012). She aims to repeat the PDSA cycle following implementation of her new training methods, using staff feedback and post-training assessment to test what works well and to learn from what does not work. This will also allow her to determine whether her training process is reliable, and that it works for different staff teams.

**Key points:**

For a rare outcome like cardiopulmonary arrest, assessing the impact of CPR training via clinical audit would have required a very long audit time frame – the PDSA cycle allowed Lynne to assess her intervention in a much shorter period.

## Run charts

A **run chart is a graph of data over time** ⧉, and offers a simple and effective tool to help you determine whether the changes you are making are leading to improvement. Run charts are simple to construct – the horizontal (x) axis is usually a time scale (e.g. weeks; April, May, June, etc.; or quarter 1, quarter 2, etc.) and the vertical (y) axis is the aspect of health care being assessed (e.g. surgical site infection rate, daily magnetic resonance imaging (MRI) start time, compliance with completion of surgical safety check lists).

Once you have at least ten observations, you can plot your data and calculate the median value, which is then projected into the future on the chart. Annotate your run chart to indicate where any changes were implemented. There are simple rules to help you interpret your run chart and to determine if a change has resulted in an improvement (Perla et al., 2011).

Run charts can be a helpful way to make progress visible to the practice team, providing a powerful display of the linkage between change and improved outcomes, and to ensure that improvement is being sustained over time.

## Performance polygons

Performance polygons offer a method to allow you to Assess multiple different aspects of quality of care in a single visual representation. Each outcome measure is plotted on a single line from 'lowest performance' to 'best performance' and performance data are then plotted, with the lines for each measure joined to form a 'performance polygon' (Cook et al., 2012). Markers can be used to show benchmark data or results of previous audit or assessments, to facilitate comparisons of overall performance. This could offer a simple method for you to track your own clinical or EBVM performance over time.

## Health failure modes and effects analysis

Health failure modes and effects analysis (HFMEA) is a systematic, proactive quality improvement method for process evaluation. It is a particularly useful method for evaluating a new process prior to implementation or for assessing the impact of a proposed change to an existing process.
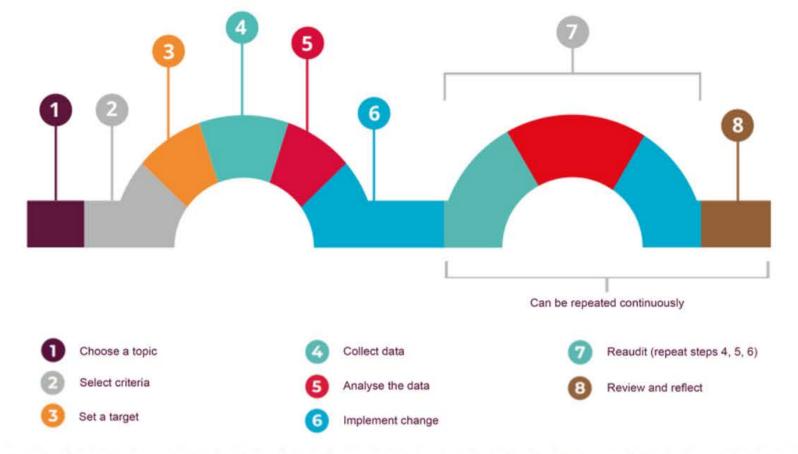
A multidisciplinary team representing all areas of the process being evaluated identifies where and how a process might fail (failure modes), possible reasons for failing (failure causes) and assesses the relative impact of different failures (failure effects). Failure mode causes are prioritised by risk grading (hazard analysis) to identify elements of the process in most need of change (Marquet et al., 2012). Team members with appropriate expertise then work together to devise improvements to prevent those failures.

# 8. Quiz

1. When is it most important to assess and reflect on our clinical decision-making?

○ Before a practice inspection

Incorrect. It is important to view reflection and assessment as an on-going part of practice.

○ When something has gone wrong

Incorrect. While it is important to reflect in these situations, it is also important to reflect and assess our decision-making even when things do not go wrong.

○ When we have an unexpected outcome

Incorrect. While it is important to reflect in these situations, it is also important to reflect and assess when outcomes are expected.

○ When deciding to buy new equipment

Incorrect. While assessing whether new equipment would be beneficial to clinical outcomes is important, reflection and assessment should be a continual process.

○ Assessment and reflection should be an ongoing process

Correct. Reflection and assessment should be a continual process.

[ Check answer ]   [ Show answers and explanations ]


2. What is the definition of clinical audit?

○ A structured activity which is intended to provide new knowledge which is generalisable (i.e. of value to others in a similar situation) and intended for wider dissemination.

Incorrect. This is a definition of research. The key component of clinical audit is that clinical performance is reviewed (or audited) to ensure that what should be done is being done.

○ A process by which protocols and guidelines are created by policy-makers and implemented at a national level.

Incorrect. Clinical audit is done at a practice level. The key component of clinical audit is that clinical performance is reviewed (or audited) to ensure that what should be done is being done.

○ A quantifiable method of testing a new hypothesis in clinical practice.

Incorrect. Clinical audits do not test hypotheses. The key component of clinical audit is that clinical performance is reviewed (or audited) to ensure that what should be done is being done.

○ A Quality Improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit measures and the implementation of change.

Correct. The key component of clinical audit is that clinical performance is reviewed (or audited) to ensure that what should be done is being done.

○ A method of conducting research in clinical practice, in order to get specific data relevant to that population.

Incorrect. In some cases research is needed first in order to perform a clinical audit, however the key component of clinical audit is that clinical performance is reviewed (or audited) to ensure that what should be done is being done.

[ Check answer ]   [ Show answers and explanations ]

| | | |
|---|---|---|
| **1** Choose a topic | **4** Collect data | **7** Reaudit (repeat steps 4, 5, 6) |
| **2** Select criteria | **5** Analyse the data | **8** Review and reflect |
| **3** Set a target | **6** Implement change | |

3. Which of the steps represented in the audit cycle image above are equivalent to the NICE 'Sustaining Improvement' stage?

○ Item 1

Incorrect. Items 7 and 8 (re-audit and review and reflect) equate to NICE's sustaining improvement stage. Item 1 equates to NICE's preparing for audit stage.

○ Items 4 and 5

Incorrect. Items 7 and 8 (re-audit and review and reflect) equate to NICE's sustaining improvement stage. Items 4 and 5 equate to NICE's measuring performance stage.

○ Items 2 and 3

Incorrect. Items 7 and 8 (re-audit and review and reflect) equate to NICE's sustaining improvement stage. Items 2 and 3 equate to NICE's selecting criteria stage.

○ Item 6

Incorrect. Items 7 and 8 (re-audit and review and reflect) equate to NICE's sustaining improvement stage. Item 6 equates to NICE's making improvements stage.

○ Items 7 and 8

Correct. Items 7 and 8 (re-audit and review and reflect) equate to NICE's sustaining improvement stage.

[ Check answer ]   [ Show answers and explanations ]

4. Place the five steps of the Evidence-based Veterinary Medicine (EBVM) cycle in the correct order.

○ Appraise, Ask, Acquire, Apply, Assess

Incorrect

○ Acquire, Apply, Appraise, Ask, Assess

Incorrect

○ Assess, Acquire, Apply, Appraise, Ask

Incorrect

○ Ask, Acquire, Assess, Apply, Appraise

Incorrect

○ Ask, Acquire, Appraise, Apply, Assess

Correct, this is the right order.

[ Check answer ]   [ Show answers and explanations ]

5. For an audit sample of 60 cases, where 42 cases meet your audit criterion, 13 cases do not, and 5 cases are considered to meet a predefined exception, how would you calculate compliance with your audit criterion?

○ 5 ÷ 60 x 100

Incorrect. The numerator is the total number of cases to which the audit criterion applies, which met the criterion. The denominator is the total number of cases to which the audit criterion applies, obtained by subtracting cases meeting the agreed exception.

○ 13 ÷ 60 x 100

Incorrect. The numerator is the total number of cases to which the audit criterion applies, which met the criterion. The denominator is the total number of cases to which the audit criterion applies, obtained by subtracting cases meeting the agreed exception.

○ 42 ÷ 60 x 100

Incorrect. The denominator is the total number of cases to which the audit criterion applies, obtained by subtracting cases meeting the agreed exception.

○ 42 ÷ 55 x 100

Correct. The denominator is the total number of cases to which the audit criterion applies, obtained by subtracting cases meeting the agreed exception.

○ 13 ÷ 55 x 100

Incorrect. The numerator is the total number of cases to which the audit criterion applies, which met the criterion.

Check answer    Show answers and explanations

# 9. Summary

## Learning outcomes:

You should now be more familiar with how to:

- explain why it is important to assess/audit the implementation of EBVM in practice

- describe how to assess/audit EBVM in practice

- use practice examples to demonstrate the use of clinical audit and the assessment of EBVM in practice.

**Now move on to the What next? section** →

# 10. References

Bellows, J. et al. (2019) 2019 AAHA Dental Care Guidelines for Dogs and Cats. *Journal of the American Animal Hospital Association*, 55 (2), pp. 49-69

Buttery, Y. (1998) Implementing evidence through clinical audit. In: Bury, T. and Mead, J. (eds) *Evidence-based Healthcare: a Practical Guide for Therapists*. Oxford: Butterworth-Heinemann, pp. 182-207

Cook, T. M., Coupe, M. and Ku, T. (2012) Shaping quality: the use of performance polygons for multidimensional presentation and interpretation of qualitative performance data. *British Journal of Anaesthesia*, 108 (6), pp. 953-960

Dunn, F. and Dunn, J. (2012) Clinical audit: application in small animal practice. *In Practice*, 34 (4), pp. 243-245

Fletcher, D.J. et al. (2012) RECOVER evidence and knowledge gap analysis on veterinary CPR. Part 7: Clinical guidelines. *Journal of Veterinary Emergency and Critical Care*, 22 (s1), pp. S102-S131

Hewitt-Taylor, J. (2003) Developing and using clinical guidelines. *Nursing Standard,* 18 (5) , pp. 41-4

Hewitt-Taylor, J. (2004) Clinical guidelines and care protocols. *Intensive and Critical Care Nursing*, 20 (1), pp. 45-52

Koshy, K. et al. (2017) Reflective practice in health care and how to reflect effectively. *International Journal of Surgery Oncology*, 2 (6), e20

Knapp, R. et al. (2017) Change in children's oral health-related quality of life following dental treatment under general anaesthesia for the management of dental caries: a systematic review. *International Journal of Paediatric Dentistry*, 27 (4), pp. 302-312

Mair, T.S. (2006) Evidence-based medicine and clinical audit: what progress in equine practice? *Equine Veterinary Education,* 18 (1), pp. 2-4

Marquet, K. et al. (2012) ENT One Day Surgery: critical analysis with the HFMEA method. *B-ENT*, 9, pp. 193-200

Maxwell, R.J. (1992) Dimensions of quality revisited: from thought to action. *Quality in Health Care*, 1 (3), pp. 171

Moore, D.A. and Klingborg, D.J. (2003) Using clinical audits to identify practitioner learning needs. *Journal of Veterinary Medical Education*, 30 (1), pp. 57-61

Mosedale, P. (2017) Learning from mistakes: the use of significant event audit in veterinary practice. *Companion Animal*, 22 (3), pp. 140-143

Mosedale, P. (2019) Clinical audit in veterinary practice  the role of the veterinary nurse. *The Veterinary Nurse,* 10 (1) , pp. 4-10

Mosedale, P. (2020) Quality improvement, checklists and systems of work: why do we need them? *The Veterinary Nurse,* 11 (6) , pp. 244-249

National Health Service (NHS) White Paper: Secretaries of State for Health, Wales, Northern Ireland and Scotland (1989) *Working for patients*. London: HMSO (Cmnd 555)

National Institute of Clinical Excellence (2002) *Principles of best practice in clinical audit*. Radcliffe Medical Press: Abingdon. Available from: Principles-for-best-practice-in-clinical-audit.pdf [↗] [

Perla, R.J., Provost, L.P. and Murray, S.K. (2011) The run chart: a simple analytical tool for learning from variation in healthcare processes. *BMJ Quality & Safety*, 20 (1), pp. 46-51

Pringle, M. et al. (1995) *Significant event auditing. A study of the feasibility and potential of case-based auditing in primary medical care*. Occasional paper (Royal College of General Practitioners), (70), i.

Proot, J.L.J. and Corr, S.A. (2013) Clinical audit for the tibial tuberosity advancement procedure. *Veterinary and Comparative Orthopaedics and Traumatology*, 26 (4), pp. 280-284

Rose, N., Toews, L. and Pang, D.S. (2016a) A systematic review of clinical audit in companion animal veterinary medicine. *BMC Veterinary Research*, 12 (1), p. 40

Rose, N., Kwong, G.P. and Pang, D.S. (2016b) A clinical audit cycle of post-operative hypothermia in dogs. *Journal of Small Animal Practice*, 57 (9), pp. 447-452

Shaw, E.K. et al. (2012) How team-based reflection affects quality improvement implementation: a qualitative study. *Quality Management in Health Care*, 21 (2), pp. 104

Siering, U. et al. (2013) Appraisal tools for clinical practice guidelines: a systematic review. *PLoS One*, 8 (12), e82915

Smith, R. (1992) *Audit and research. BMJ*, 305 (6859), pp. 905

Taylor, M. (2013) Systematic review of the application of the plan–do–study–act method to  et al improve quality in healthcare. *BMJ Quality & Safety*, 23 (4), pp. 290–298

Viner, B. (2009) Using audit to improve clinical effectiveness. *In Practice*, 31 (5), pp. 240-243

Waine, K. and Brennan, M. (2015) Clinical audit in veterinary practice: theory v reality. *In Practice*, 37 (10), pp. 545-549

Waine, K. et al. (2018a) Clinical audit in farm animal veterinary practice. *In Practice*, 40 (8), pp. 360-364

Waine, K. et al. (2018b) Clinical audit in farm animal veterinary practice. Part 2: conducting the audit. *In Practice*, 40 (10), pp. 465-469

Whiting, M. et al. (2017) Survey of veterinary clients' perceptions of informed consent at a referral hospital. *Veterinary Record*, 180 (1), pp. 20

Wylie, C.E. (2015) Prospective, retrospective or clinical audit: A label that sticks. *Equine Veterinary Journal*, 47 (3), pp. 257-259

**Now move onto the What next? section** →

# What next?

# Table of contents

# 1. Continuing your EBVM journey



**Congratulations! You've completed the EBVM Learning course. We hope you feel you've improved your knowledge about EBVM, and thought of ways you can apply it to your everyday practice.**

There is an increasing momentum behind EBVM within the profession, so there will be growing numbers of resources for you to access to continue to improve your EBVM learning. If you haven't done so already, check out the links within this course and see what else is out there on different sites.

Other ideas would be to submit a clinical query ⬀ to RCVS Knowledge's *Veterinary Evidence* journal ⬀ and access their Quality Improvement resources ⬀. You could also sign up to RCVS Knowledge's journal watch 'inFOCUS' ⬀ and monthly newsletter intheKNOW ⬀, and subscribe to the CEVM mailing list ⬀ .

Find out more about EBVM's equivalent in human medicine by joining the Students 4 Best Evidence ⬀ network, and by accessing the CEBM website ⬀ .

## CPD

If you're a member of the RCVS or a Registered Veterinary Nurse in the UK, don't forget to log your CPD.

Log your CPD at the RCVS 1CPD website ⬀ or scan the QR code below.

## Log your CPD



The EBVM Learning team is currently working on a version designed for practitioners with practical tips for applying EBVM in veterinary practices. More details will follow shortly.

## Feedback

Please take a few minutes to provide feedback on this course to help us improve it in future. You can do this via the feedback form.

# 2. Feedback form

What did you like the most?

What did you like the least?

What could be improved upon?

What did you use the course for?

How did you locate the course?

Would you use the course again in the future?

○ Yes
○ No
○ Unsure

Would you recommend the course to colleagues/other students?

○ Yes
○ No
○ Unsure

General comments

Your name

Your email address

Job title/position

○ Veterinarian
○ Veterinary nurse/technician
○ Veterinary undergraduate student
○ Veterinary postgraduate student
○ Veterinary nurse undergraduate student
○ Veterinary nurse postgraduate student
○ Other

If other, please specify

In what area of the profession do you currently work?

○ Private practice
○ Academia
○ Government
○ Industry (pharmaceutical)
○ Industry (other)
○ Not applicable
○ Other

If other, please specify

Country

Afghanistan ▼

Submit

RCVS Knowledge is the charity partner of the Royal College of Veterinary Surgeons (RCVS). We will use the information you supply by completing this form to help us develop EBVM Learning. We will process your data for as long as we have your consent to do so. We are committed to the privacy of your personal information and will process your data in line with our privacy policy and the General Data Protection Regulations. Your personal information will not be shared with outside third parties and you have the right to withdraw your consent to the processing of your personal data at any time.

# About this course

# Table of contents

# About EBVM Learning

**The development work on the initial version of this course was completed during the EBVM Learning I project (2015).** It has been updated during the EBVM Learning II project (2019-20) using feedback from users and a review of each section by team members.

The projects have been supported by RCVS Knowledge ⬀ who also manage the website.

The content of this course can be used and shared in accordance with the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International licence (CC BY-NC-SA 4.0) ⬀. Find out more about acceptable use of the material in this course.

.

# Contributors

A group of people (academics and practitioners) have contributed to the development of EBVM Learning and were involved in the projects 'EBVM Learning I' to develop the original version of EBVM Learning (2014-15) and/or 'EBVM Learning II' to gather feedback on the resources and produce the updated version (2019-20).

- **Ellie Sellers**, University of Bristol, UK (EBVM II Project Co-lead)
- **Sarah Baillie**, University of Bristol, UK (EBVM II Project Co-lead)
- **Emma Gallop**, University of Bristol, UK (EBVM I Project Co-lead)
- **Kristen Reyher**, University of Bristol, UK (EBVM I Project Co-lead)
- **Rachel Dean**, Vet Partners, UK (EBVM I Project Co-lead)
- **Sebastian P. Arlt**, Freie Universität Berlin, Germany
- **Clare Boulton**, RCVS Knowledge, UK
- **Marnie Brennan**, University of Nottingham, UK
- **David Brodbelt**, Royal Veterinary College, UK
- **Fiona Brown**, University of Edinburgh, UK
- **Louise Buckley**, University of Edinburgh, UK
- **Myai Du**, RCVS Knowledge, UK
- **George Goran**, University of Agricultural Sciences and Veterinary Medicine of Bucharest, Romania
- **Douglas J. C. Grindlay**, University of Nottingham, UK
- **Laura Haddock**, University of Bristol, UK
- **Ian Handel**, University of Edinburgh, UK
- **Mark Holmes**, University of Cambridge, UK
- **Jo Ireland**, University of Liverpool, UK
- **Heidi Janicke**, St. George's University, Grenada
- **Alison Mann**, University of Bristol, UK
- **Catherine McGowan**, University of Liverpool, UK
- **Heather K. Moberly**, Texas A&M University, USA
- **Tim Parkin**, University of Glasgow,UK
- **Emma Place**, University of Bristol, UK
- **Md Mizanur Rahman**, Chattogram Veterinary and Animal Sciences University, Bangladesh
- **Gwen Rees**, University of Bristol, UK
- **Javier Sanchez**, University of Prince Edward Island, Canada
- **Johan P. Schoeman**, University of Pretoria, South Africa
- **Darren Shaw**, University of Edinburgh, UK
- **Paul Smith**, PJS Web, UK
- **Laura Urdes**, University of Agricultural Sciences and Veterinary Medicine of Bucharest, Romania
- **John VanLeeuwen**, University of Prince Edward Island, Canada
- **Kristien Verheyen**, Royal Veterinary College, UK
- **Sheena Warman**, University of Bristol, UK

# Help

## Using the course

There are a number of ways of approaching this course. We recommend that you work through the entire course, however you may wish to use the individual sections as standalone learning.

- If you are entirely new to the concept of EBVM, it is best to start with the ABCs of EBVM and work through the course from there.

- You may wish to tackle one section this week and the next section in a few weeks' time, or you may wish to spend the day learning about EBVM and work through the whole course in one go.

- The right-hand menu displays the content in each section. If you're accessing the course on your mobile, this menu will appear beneath the main page content.

- If you want to learn more about a specific topic, the pink expandable boxes enable you to read about the subject in more detail, or you can use the search button at the top right of the screen to identify every place this subject is discussed.

- Each page has previous/next links at the bottom to help you progress through the course. Alternatively you can jump to specific sections or pages in the course using the main navigation bar at the top, or the menu on the right-hand side.

- Remember to use the glossary for any clarification of words and terms you don't understand.

- A downloadable version of the entire EBVM Learning course is available as a PDF. Please note that the hyperlinks were correct at the time of publication, but may become out of date over time.

# Glossary

**Accredited practices (RCVS):** The Royal College of Veterinary Surgeons is the United Kingdom's professional registration body. The RCVS Practice Standards Scheme is a voluntary initiative to accredit veterinary practices in the UK. Through setting standards and carrying out regular inspections, the Scheme aims to promote and maintain the highest standards of veterinary care.

**Audit cycle:** A systematic review of a practice, process or performance to establish how well it meets predetermined criteria. The procedure includes identifying problems, developing solutions, making changes to practice and then reviewing the whole operation or service again.[1]

**Best Evidence Topic (BET):** A BET is a simple, unbiased review of current best evidence on a very specific clinical topic. It is designed to be a quick and achievable method of incorporating evidence into clinical practice. It is similar to a Critically Appraised Topic (CAT) or a Knowledge Summary (KS). See: https://bestbetsforvets.org

**Bias:** Systematic (as opposed to random) deviation of the results of a study from the 'true' results, which is caused by the way the study is designed or conducted.[1]

**Bibliographic databases:** Bibliographic databases store information about journal articles and conference proceedings (e.g. title, author, abstract, key words) within a specified subject area. Databases can be searched to help find references.

**Boolean operators:** Simple words (AND, OR, NOT or AND NOT) used to combine or exclude keywords in a search, resulting in more focused and productive results.

**Case report:** A case report is a description of a single case (or small number of cases).

**Case series:** A case series is a description of the presentation, diagnosis, treatment and outcome of a group of animals with the same disease. There are no disease-free animals for comparison, and any differences in management are not randomly allocated (for example, they may be due to the owners' preferences or different protocols between centres).

**Case-control study:** A case-control study is a retrospective study comparing animals with the disease (cases) and without the disease (controls) of interest. The animals' histories are examined to identify risk factors for the disease.

**Citation search:** A citation search allows you to specify a key article, author or book, and find other articles that have included that specific resource in their bibliographies.

**Clinical audit:** A process for monitoring standards of clinical care to ensure the best possible care (known as 'best practice'). Clinical audit can be described as a systematic 'cycle'. It involves measuring care against specific criteria, taking action to improve care if necessary and monitoring the process to sustain improvement. As the process continues, an even higher level of quality is achieved.[1]

**Clinical bottom line:** This is the overall answer to a clinical question, based on critical appraisal of the relevant evidence found through searching the veterinary literature.

**Clinical decision-making:** Clinical decision-making is a balance of experience, awareness and knowledge and information gathering, along with using appropriate assessment tools, your colleagues and evidence-based practice to guide you.

**Clinical governance:** Clinical governance is a systematic approach to continuously maintaining and improving the quality of patient care within a health system.

**Clinical question:** A question that may occur in veterinary practice. The question may be regarding drug efficacy, diagnostic test, evaluation, prognosis, risk, etc.

**Clinical relevance:** How relevant the study results are to actual clinical outcomes. Effects identified as statistically significant are not always clinically significant, either because the effect is small or the outcome is not important.

**Clinical research:** Clinical research is scientific research in a clinical context. Clinical research directly involves a particular patient or population. A clinical trial is one type of clinical research that follows a pre-defined plan or protocol.

**Cohort study:** A cohort study is an observational study where exposed and unexposed groups (cohorts) are followed over a period of time. At the end of the study period, the outcome (e.g. disease) is measured. Cohort studies can identify risk factors associated with disease and estimate incidence.

**Comparator:** The standard intervention against which an intervention is compared in a study. The comparator can be no intervention (for example, best supportive care) or a commonly administered treatment.[1]

**Complication rate:** The number of subjects in an at-risk population that will develop complications in a given amount of time.

**Control:** A group of patients in a study who do not receive the treatment or test being studied. Instead, they may receive the standard treatment (sometimes called 'usual care') or a dummy treatment (placebo). The results for the control group are compared with those for a group receiving the treatment being tested, in order to assess any differences in response.[1]

**Critically Appraised Topic (CAT):** A 'critically appraised topic' is a quick and simple form of evidence synthesis where a specific clinical question is answered by searching the relevant literature. It is similar to a Best Evidence Topic (BET) or a Knowledge Summary (KS).

**Cross-sectional study:** A cross-sectional study looks at a sample of the population at a single point in time, most commonly to determine the prevalence of a certain disease.

**Diagnostic tests:** Tests used in order to aid diagnosis of a patient (e.g. haematology, biochemistry, etc.).

**Diagnostic test validation study:** A diagnostic test validation study is used to establish the usefulness of new diagnostic tests. Animals are tested using the new diagnostic test and the current gold standard to establish the sensitivity, specificity and likelihood ratios for the new diagnostic test.

**Electronic communication:** Communication such as email, web forums, wiki software, Facebook and Twitter accounts.

**Epidemiology:** Epidemiology is the study of the distribution and determinants of health-related states or events (including disease), and the application of this study to the control of diseases and other health problems.[2]

**Evidence:** Information on which a decision or guidance is based. Evidence is obtained from a range of sources, including randomised controlled trials, observational studies and expert opinion (of healthcare and other professionals and/or patients).[1]

**Evidence synthesis or summary:** An evidence synthesis is a collation of the current evidence available to answer a clinical question. Evidence syntheses may come in many forms and can appraise the evidence in various ways. Some examples are Knowledge Summaries, Critically Appraised Topics, Best Evidence Topics, systematic reviews and meta-analyses.

**Expert opinion:** Expert opinion can be one individual's opinion or part of an elicitation process based on a panel of experts used to answer a question of interest. Expert opinion may provide some evidence where no information is available (e.g. new treatment efficacy or application to a new population).

**External validity:** The degree to which the results of a study hold true in non-study situations, for example in routine veterinary practice. May also be referred to as the generalisability of study results to non-study populations.[1]

**Grey literature:** Grey literature is information or research output produced by organisations outside of commercial or academic publishing and distribution channels.

**Intervention:** In clinical terms, a drug treatment, surgical procedure, diagnostic test or management change.

**Journal club:** Normally, practice-run journal clubs involve clinicians meeting at regular intervals to review recently published literature of relevance in an in-depth way.

**Knowledge Summary (KS):** A Knowledge Summary is a short critical summary of the best available information on a defined clinical question. It provides a concise conclusion which should be easily accessible by clinical staff. It is similar to a Critically

Appraised Topic (CAT). See: https://www.veterinaryevidence.org/index.php/ve/browseSearch/sections/view?sectionId=2 ↗

**Meta-analysis:** A meta-analysis is a quantitative statistical analysis (generally) conducted as part of a systematic review. By combining the data, a meta-analysis provides more evidence than each individual study is able to on its own.

**Morbidity:** The number of cases of an illness, injury or condition within a given time (usually a year). It can also refer to the percentage of patients with a particular illness, injury or condition within a defined population.

**Mortality:** The proportion of a population that dies within a particular period of time. The rate is often given as a certain number per 1000 animals.

**Narrative reviews:** A narrative review is a review of the evidence done by an expert in the area, without the use of systematic guidelines and checklists which sets them apart from systematic reviews.

**Open access:** Literature that is available to be viewed and used without subscription.

**Outcome:** The impact that a test, treatment, policy, programme or other intervention has on an animal, group or population.

**Peer-review:** Review of a study, service or recommendation by those with similar interests and expertise to the people who produced it to make sure the study results are accurate and valid. Peer-reviewers can include both professionals and 'lay' experts. The peer-review process subjects scientific research papers to independent scrutiny by other qualified scientific experts (peers) before they are made public.[1, 3]

**PICO:** Acronym indicating **P**opulation, **I**ntervention, **C**omparison and **O**utcome framework. This is a structured approach for developing review questions, dividing each question into four components: the population (the population under study); the interventions (what is being done); the comparators (other main treatment options); and the outcomes (measures of how effective the interventions have been).[1]

**Pilot study:** A small-scale 'test' of a particular approach that aims to highlight any problems or areas of concern and amend it before a full-scale study begins.[1]

**Population:** A group of patients with a common link, sharing the same medical condition, breed or other characteristics. The population for a clinical trial will be all the patients the test or treatment is designed to help (such as Labradors with hip dysplasia). It is best if populations involved in studies are representative of the whole population of interest.[1]

**Population health:** Not merely the sum of the health of the individuals that make up a population, but the distribution of disease and health factors within that population.

**Primary evidence:** Primary evidence in EBVM generally refers to the original research papers written by those who conducted the study at the time of the study e.g. peer-reviewed journal articles that report on a single scientific study.

**Publication bias:** Publication bias occurs when the results of studies showing that a treatment works well are published, and studies showing it did not have any effect are not published. If this happens, analysis of the published results will not give an accurate idea of how well the treatment works.[1]

**Practice meetings:** Practice meetings are a formal forum for all practice staff to raise and discuss any issues concerning the practice.

**Practice protocols:** Protocol-based care within veterinary practices means having standardised, evidence-based guidelines for veterinarians to use in certain circumstances (e.g. a farm animal practice might have protocols for first and second line antimicrobial treatment of mastitis based on pathogens known to be present on a farm).

**Randomised controlled trial:** A randomised controlled trial is an intervention study used to assess a treatment or other intervention. Study subjects are randomly allocated to either the intervention group or a control group (which receives either no treatment, a placebo, the current best treatment or a comparator). Ideally, the study should be 'blinded' so that anyone involved with the animals does not know which treatment each animal received.

**Recurrence rate:** The number of an at-risk population that will have a recurrence of a disease in a given amount of time.

**Reflection:** Reflection on current practices means looking back at the effect the current guidelines, protocols or standards of care have on clinical outcomes, and assessing whether changes may be necessary.

**(Relative) Risk:** The ratio of the risk of disease or death among those exposed to certain conditions compared with the risk for

those who are not exposed to the same conditions. If both groups face the same level of risk, the relative risk equals 1.[1]

**Rounds:** Practice rounds is a forum for clinicians to meet in order to discuss ongoing and hospitalised cases. This is an effective way of ensuring case continuity as well as discussing case management.

**Sample:** Participants of a study recruited from the study's target population. If these participants are recruited in an unbiased way, it may be possible to generalise the results to the target population as a whole.[1]

**Search strategies:** Search strategies are the methods we can employ in order to systematically search the veterinary literature for evidence that may answer our clinical question.

**Secondary evidence:** Secondary evidence in EBVM generally refers to publications that review, summarise or synthesise previous studies and are usually written by a third party e.g. text books, review articles, meta-analyses, knowledge summaries, systematic reviews.

**Sensitivity:** The sensitivity of a clinical test refers to the ability of the test to correctly identify those patients with the disease.

**Specificity:** The specificity of a clinical test refers to the ability of the test to correctly identify those patients without the disease.

**Strength of evidence:** The strength of evidence is determined by a combination of the study type, robustness of study design and applicability of study results.

**Study design:** The way a study is designed. Case-control study, cohort study, non-randomised controlled trial, and randomised controlled trial are all examples of study designs using different research methodologies.[1]

**Study quality:** The extent to which a study has conformed to recognised good practice in the design and execution of its research methods.[1]

**Survey:** A study in which information is systematically collected from people (usually from a sample within a defined population).[1]

**Synonym:** A word or phrase that means the same as another word or phrase in the same language.

**Systematic review:** A systematic review is a defined and rigorous method of collating and summarising the information from all published papers addressing a particular question. The methods used to search the literature, assess the quality, and make conclusions are explicitly stated in the methods section.

**Veterinary literature:** Veterinary literature is the source of evidence available for us in the veterinary profession. There are many veterinary peer-reviewed journals published worldwide, some are subscription only and some are increasingly open access.
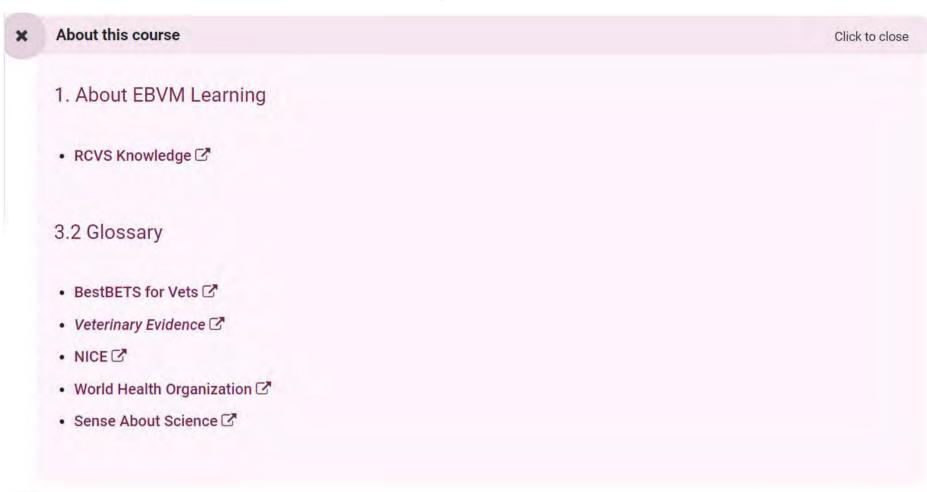
## References

[1] NICE glossary ☐

[2] World Health Organization ☐

[3] Sense About Science ☐

# Links

This page contains all the links to websites and resources which have been referenced within the course. They are listed by section and page, and are presented in the order in which they appear in the text.

## About this course

### 1. About EBVM Learning

- RCVS Knowledge ⤴

### 3.2 Glossary

- BestBETS for Vets ⤴
- *Veterinary Evidence* ⤴
- NICE ⤴
- World Health Organization ⤴
- Sense About Science ⤴

## ABCs of EBVM

### 2. What is EBVM?

- Centre for Evidence-Based Veterinary Medicine (CEVM) ⤴

### 3. History of EBVM

- Cochrane Collaboration ⤴
- The Centre for Evidence-Based Medicine (CEBM) ⤴
- Centre for Evidence-Based Dentistry (CEBD) ⤴

### 4. The development of EBVM

- NICE guidelines ⤴
- British Veterinary Association (BVA) ⤴
- American Veterinary Medical Association (AVMA) ⤴
- Evidence-based Veterinary Medicine Association (EBVMA) ⤴
- Centre for Evidence-based Veterinary Medicine ⤴
- RCVS Knowledge ⤴
- *Veterinary Evidence* ⤴
- RCVS Knowledge: *inFOCUS* ⤴
- RCVS Knowledge Library and Information Services ⤴
- Evidence-Based Veterinary Medicine Matters ⤴
- CIVME EBVM Toolbox ⤴

## 5. Why is EBVM important?

- RCVS Knowledge: Practice guidelines ⬀

## 5.1 Information overload

- BestBETS for Vets ⬀
- Knowledge Summaries ⬀
- RCVS Knowledge *inFocus* ⬀

## 5.2 How does EBVM apply to Quality Improvement?

- RCVS Knowledge: Quality improvement ⬀
- RCVS Practice Standards Scheme ⬀
- RCVS Knowledge: Thoughts on QI ⬀

## 6. Challenges of EBVM

- RCVS Knowledge Library and Information Services ⬀

## 7. What is helping to address EBVM challenges?

- VetCompass ⬀
- SAVSNET ⬀
- BestBETS for Vets ⬀
- Knowledge Summaries ⬀
- Submit your clinical query to RCVS Knowledge ⬀
- Writing your own Knowledge Summary ⬀

---

**✖ Ask**                                          Click to close

## 6. Example scenarios using the PICO format

- PICO.vet ⬀

## 2. Acquiring evidence

- *Veterinary Evidence* ⬈
- BestBETS for Vets ⬈

## 3.1 Secondary sources

- The Cochrane Handbook for Systematic Reviews of Interventions ⬈
- Cochrane UK ⬈
- How to write a Knowledge Summary ⬈

## 3.2 Evidence syntheses

- Cochrane Database of Systematic Reviews ⬈
- VetSRev database ⬈
- NICE Evidence Search ⬈

## 3.4 Bibliographic databases

- CAB Abstracts ⬈
- *Veterinary Evidence* ⬈
- List of Journals Indexed for MEDLINE ⬈
- Veterinary Journals Indexed in PubMed ⬈
- RCVS Knowledge: sources of evidence ⬈
- Veterinary Science Search and Veterinary Information Resources ⬈
- Information for Veterinary Professionals ⬈
- EBSCO ⬈
- Ovid ⬈
- ProQuest Dialog ⬈
- Web of Science ⬈

## 3.5 Internet search tools

- PubMed ⬈
- DOAJ ⬈
- Think Check Submit ⬈
- Google ⬈
- Google Scholar ⬈
- Wikipedia ⬈

## 4. How do I access the evidence?

- Deep Dyve ⊡
- Open access ⊡

## 4.2 For vets in practice

- PubMed ⊡
- PubAg ⊡
- VetMed Resource ⊡
- RCVS Knowledge Library and Information Services ⊡
- RCVS Knowledge Library membership ⊡
- American Veterinary Medicine Association (AVMA) ⊡
- British Veterinary Association (BVA) ⊡
- European Society of Veterinary Dermatology (ESVD) ⊡

## 5. How do I search for the evidence?

- PubMed for Veterinarians ⊡
- PubMed online training from the US National Library of Medicine ⊡
- Ovid ⊡
- Scopus ⊡
- Web of Science ⊡
- CAB Abstracts - Resources for Database User ⊡
- VetMed Resource training videos ⊡

## 5.7 Refining your search

- InterTASC Information Specialists' Sub-Group Search Filter Resource ⊡
- MeSH Tree ⊡

## 5.8 Citation searching

- Web of Science ⊡
- Scopus ⊡
- Google Scholar Citations ⊡

## 6.2 Sharing a search for publication

- Guidance on compiling a Knowledge Summary 🡵
- Knowledge Summary template 🡵
- Reporting a literature search for BestBETs for Vets 🡵
- PRISMA 🡵
- SYREAF 🡵
- Meridian 🡵

## 6.3 Reference management tools

- Zotero 🡵
- Mendeley 🡵
- EndNote Online 🡵
- EndNote 🡵
- RefWorks 🡵

## 9. References

- EBVM Toolkit 2: finding the best available evidence 🡵
- AGREE: Practice Guidelines 🡵
- Cochrane handbook for systematic reviews of interventions 🡵

**✖ Appraise**

## 3.1. How to read a paper

- Equator network: Guidance on scientific writing ↗
- List of resources produced through the BMJ explaining how to read and interpret different kinds of papers ↗

## 4.1 What is the study type (or design)?

- RCVS Knowledge EBVM Toolkit 4 – What type of study is it? ↗

## 5.2 Critical appraisal and appraisal toolkits

- RCVS Knowledge toolkits ↗
- Centre for Evidence-based Veterinary Medicine toolkits ↗
- Critical Appraisal Skills Programme ↗
- University of Adelaide critical appraisal tools ↗

## 5.3 Other sources of bias

- STROBE-VET reporting guidelines ↗

**✖ Apply**

## 3.1 Consider the individual circumstances of your clinical scenario

- Centre for Evidence-based Veterinary Medicine (CEVM)

## 3.2 Sharing evidence with your clients

- BMJ EBM toolkit ↗

## 4. Developing clinical practice guidelines and protocols

- RCVS Knowledge resources providing guidelines tools and CPD ↗

### 3.2 Assess as part of clinical governance

- RCVS Knowledge: Quality improvement systems ⬀
- RCVS Code of Professional Conduct for Veterinary Surgeons ⬀
- RCVS Practice Standards Scheme ⬀

## 5. Clinical audit as a quality improvement tool

- RCVS Knowledge Quality improvement resources ⬀
- RCVS Knowledge e-learning course on clinical audit ⬀
- RCVS Knowledge: The Clinical Audit Walkthrough ⬀
- Eight-stage clinical audit cycle from RCVS Knowledge ⬀
- Measure current practice ⬀
- Analysis of existing data ⬀
- Basic summary/ descriptive statistics ⬀
- Influence activities of an individual practice ⬀

## 6. Clinical audit in the veterinary world

- RCVS Knowledge: Clinical guidelines available in veterinary medicine ⬀

### 6.1 Where to start in clinical audit

- RCVS Knowledge: Significant event audit ⬀
- RCVS Knowledge Surgical safety checklists ⬀
- RCVS: Electronic health records ⬀

### 6.3 Setting audit aims and objectives

- RCVS Knowledge: Surgical safety checklists ⬀

### 6.4 Defining audit criteria/standards

- AGREE II checklist ⬀
- RCVS Knowledge: Professional consensus statements ⬀
- RCVS Knowledge: Clinical practice benchmarking ⬀

## 7. Beyond clinical audit - alternative ways to assess

- Run chart is a graph of data over time ⬀

## 10. References

- Principles of best practice in clinical audit ⬀

**✖ What next**

## 1. Continuing your EBVM journey

- Submit a clinical query to *Veterinary Evidence* ↗
- *Veterinary Evidence* ↗
- RCVS Knowledge Quality improvement resources ↗
- RCVS Knowledge: *inFOCUS* ↗
- RCVS Knowledge: *intheKNOW* newsletter ↗
- Students 4 Best Evidence ↗
- CEVM mailing list ↗
- RCVS 1CPD website ↗
- EBVM Learning feedback form

# Acceptable use

## Reuse of course material

The content of this course may be shared in accordance with the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International licence (CC BY-NC-SA 4.0).](#) ⬀

## How to cite

When citing this website, we suggest you use the following format. For example, the citation for this page would be:
EBVM Learning 2020, *Acceptable use*. Available from:</acceptable-use>. [17th November 2020]. (where the date is the date of access)

## Images

Photographs and graphic icons used on this site have been licensed for use, and can only be reproduced as part of this material, and not as standalone objects.

Figures used on this site may be shared under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International described above, and on condition that the specific copyright holders mentioned in the figures are also acknowledged.



RCVS Knowledge is a charity with the mission to advance the quality of veterinary care for the benefit of animals, the public, and society.

We meet this mission by championing the use of an evidence-based approach to veterinary medicine, inspiring a culture of continuous quality improvement in practice, and making our resources available to the profession and wider public.