CPD article

Why do medication errors occur in veterinary practice?

Medication errors are common in veterinary practice. While many of these do not result in harm to a patient, those that do can have serious consequences for the patient and also affect the people involved. Patient safety event reporting provides insight into how and why medication errors occur in practice. Although human error plays a part, there are many contributing factors that make mistakes more likely to happen. This article discusses the types of errors that are reported, common error-producing conditions and specific high-risk situations where errors can have the most serious consequences. https://doi.org.10.12968/coan.2021.0033

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Medication errors are defined as 'any error in the prescribing, dispensing, or administration of a drug, irrespective of whether such errors lead to adverse consequences or not' (Williams, 2007). An adverse drug event is an adverse reaction to a medicine, or a failure of a medicine's efficacy. Adverse drug events may be caused by a medication error, but medication errors do not always lead to adverse drug reactions. Figures from the NHS reveal that there are an estimated 237 million errors involving medication per year, contributing to roughly 1700 deaths per year (Elliott et al, 2021). It is important to consider whether this reflects what is happening in veterinary practice. While the full story is not always known, from the data that is available it is evident that medication errors represent a significant cause of harm to animals under veterinary care.

What is known?

The data available on medication errors in veterinary practice come from systems such as the Veterinary Medicines Directorate (VMD) adverse event reporting system or the Veterinary Defence Society patient safety event reporting system, VetSafe. As these are voluntary systems, the captured data probably only represent a small proportion of all the events that happen.

Data for adverse event cases reported to the VMD between 2000 and 2014 showed 102 reports relating to medication errors (Diesel and Davis, 2015). Reports of suspected adverse events included incidents involving error as well as drug reactions. These reports are collated by VMD and published annually. The information gathered may lead to changes in the medicines contraindications or warnings and subsequently prevent future adverse events and errors.

VetSafe figures for the 12-month period to 1 March 2021 indicate that of 4768 reported patient safety events, 1451 (30%) were medication errors. This aligns with data from two large corporate groups, CVS Group (2019) and Linnaeus (2020), both of which found medication errors to account for around 30% of total reported events (*Figure 1*).

Analysis of reports from Linnaeus (2020) found that this is an underestimate, as some medication errors are reported in the 'anaesthesia' or 'inpatient' categories because they fall into more than one category.

The impact of medication errors

Not only animals, but their owners, the veterinary team and the practice itself can be adversely affected by medication errors.

Most medication errors result in minor or no harm to the patient, but some can cause severe harm or even death. Linnaeus data from 2020 found that of 955 reported medication errors, 64% caused no harm and 32% were low or moderate harm, while only 1.8% caused severe harm or death. Wallis et al (2019) studied 560 incidents reported in veterinary hospitals in the US over a 3-year period and found that 15% of errors caused harm and 8% caused permanent morbidity or death.

A mistake that causes harm can be very upsetting for the owner and can ruin the relationship between them and their veterinary practice. Even errors that don't cause harm can erode the trust they have in the practice, for example if they get home to find they've been given someone else's medication.

For the person that makes the error, it can be devastating. Making a mistake that harms a patient can have a significant impact. Professionally, this could mean a loss of confidence, avoidance of certain situations or types of work, or even leaving the profession. It can lead to long-term feelings of fear, distress and self-doubt, as well as physical symptoms and mental ill

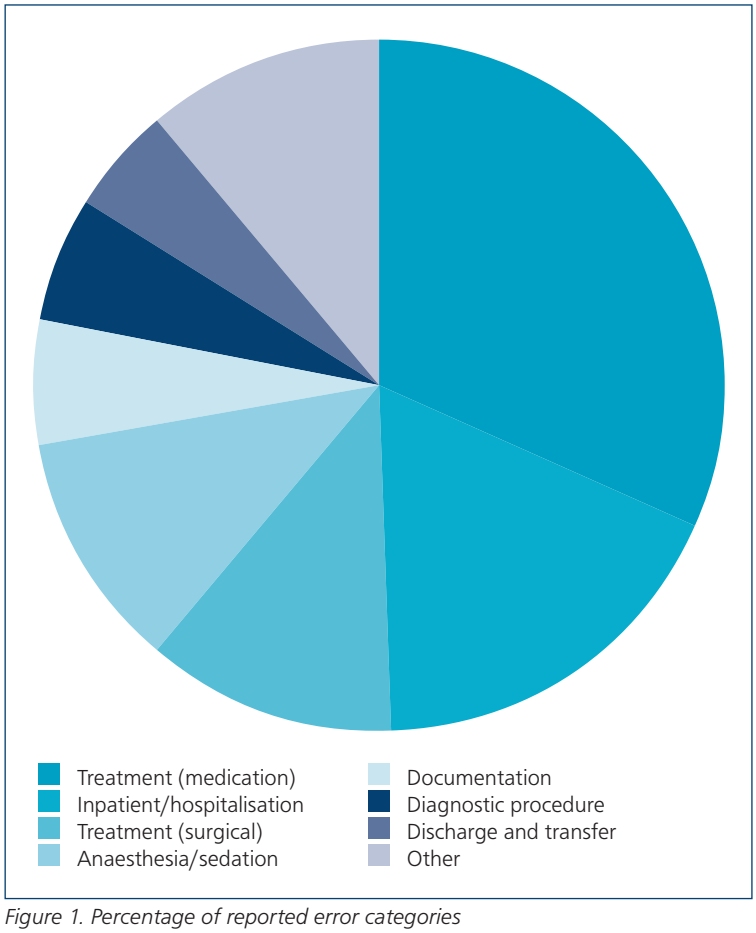

Figure 1. Percentage of reported error categories

health (Oxtoby and Mossop, 2019). The term 'second victim' has been used to describe healthcare professionals affected by medication errors in this way (Wu, 2000).

Costs may also be incurred to rectify a mistake or manage the consequences, which could result in the loss of a client or reputational damage to the practice.

The economic effects of medication errors have not been quantified in veterinary medicine. However, in human healthcare, Elliott et al (2021) found that adverse drug events as a result of avoidable error cost the NHS more than £98 million annually. This includes primary care-related adverse drug events that lead to hospital admission, costing £83.7 million and causing 627 deaths, and hospital-related adverse drug events, leading to longer hospital stays, costing £14.8 million and causing or contributing to 1081 deaths. Elliot et al (2021) commented that lack of data and links between errors and patient outcomes means that there is still uncertainty around this subject in human healthcare. This is definitely the case in veterinary healthcare too, but in the meantime, there are some small steps that can be taken, which should start to reduce medication errors.

Where does it go wrong?

As Murphy's Law states, 'anything that can go wrong, will go wrong'. The medication process has several steps and errors can occur in any of them. The three main stages in the process are prescribing, dispensing and administration. The following examples are taken from events reported in VetSafe by practices in the Linnaeus group in 2019 and 2020.

Prescribing errors

These include mistakes by the vet in the choice of medicine (for example, where there is a contraindicationas a result of concurrent disease or another medication), inappropriate antibiotic use, or prescribing an unnecessary or unsuitable drug. A vet may also inadvertently select the wrong drug, strength, formulation, or quantity from the drop-down menu on the practice management system, without realising it. They may calculate the wrong dose and a common mistake involving this is a 10-fold error caused by a decimal point in the wrong place or an error with the instructions on the label, such as the wrong frequency or place of administration, such as the wrong eye or ear.

Dispensing errors

Even where the vet has selected an appropriate medication and correctly requested this via the practice management system, it can still go wrong before that medicine reaches the patient. The person dispensing the medicine could inadvertently select the wrong item from the dispensary, count the wrong quantity of tablets, or mix up two labels for patients with similar names.

Medicine administration

The administration of medicine to the patient is another step where a variety of things can go wrong. Sometimes this happens in the owner's home, perhaps because of a misunderstanding or a lack of clarity in the instructions, but it can also happen in the practice.

Medicines might be given to the wrong patient, via the wrong route, at the wrong time or may be missed altogether. The wrong dose may be given as a result of a calculation error, infusion pump programming error or an unclear hospital sheet. Medicines can be ineffective or harmful because they are out of date, beyond their in-use shelf life or incorrectly stored (for example, at the wrong temperature).

Miscommunication is often the cause, whether written or verbal. It's easy to mishear a verbal instruction or for it to be misleading and veterinary professional's handwriting may also create confusion.

Why is medication such a problem area?

Vets, veterinary nurses and practice support staff come to work to do a good job and help their patients. In spite of this, sometimes mistakes are made and patients are harmed. Understanding more about the underlying causes is the first step to preventing this harm.

It is not fully understood why things sometimes go wrong and while the phrase 'human error' is often used, this does not always explain it. Human error is unfortunately inevitable as it is not possible to stop people behaving in a human way or making errors. If the systems they are working in allow or cause errors to happen, then those systems are the real problem. When these incidents are reviewed or discussed, there is often an emphasis on

Table 1. Level of harm guide (this categorisation is based on the outcome of the case)

Level	Definition	Examples
No harm	Patient outcome is not symptomatic, no symptoms are detected, and no treatment is required.	Dispensing errors that are spotted and corrected before any harm occurs; patient given the wrong injection but a dose well within normal range, so no harm
Low harm	Patient outcome is symptomatic, symptoms are mild, loss of function or harm is minimal or intermediate but short term. No or minimal intervention is required (such as extra observation, investigation, review or minor treatment).	Intravenous fluid overload caused by incorrect fluid rate requiring additional observation
Moderate harm	Patient outcome is symptomatic, requiring intervention (such as an additional operative procedure or therapeutic treatment), an increased length of stay, or causing permanent long-term harm or loss of function.	Non-steroidal anti-inflammatory overdose leading to renal injury and additional hospital treatment
Severe harm	Patient outcome is symptomatic, requiring life-saving intervention or major medical/surgical intervention, shortening life expectancy or causing major permanent or long-term harm or loss of function.	Enrofloxacin overdose in a cat causing permanent blindness
Death	On the balance of probabilities, death was caused or brought forward by the incident.	Accidental administration of paracetamol to a cat

'trying harder to get it right' and 'paying more attention'. Although, placing the blame on individuals will often cause the same errors keep happening.

A vet working in a first opinion small animal practice probably prescribes, supplies and dispenses at least 30 medicines per day and in most cases, the process works as expected and all is well. Because of this, it is a routine part of work and becomes hard to view as safety critical.

There are some common error-producing conditions that contribute to medicines errors. The following categories are taken from the veterinary defence society VetSafe contributory factors framework, with examples from the authors' experience:

- Patient: coexisting conditions (diagnosed or not), concurrent medications, temperament, appearance (as an example, black cats can be hard to distinguish from each other in a busy ward)
- Owner: misinterpreting or not following instructions, demanding certain types of treatment that may not be appropriate (such as antibiotics)
- Individual (staff member): factors that affect the ability to concentrate, such as fatigue, stress, hunger/thirst, physical and mental health, preoccupation, personal issues, distraction, individual perception of risk (how careful someone is); experience level and familiarity, as vets tend to develop a repertoire of drugs they feel comfortable prescribing and are less likely to use those that are new or unusual
- Task: whether standard operating procedures or guidelines exist and are used
- Communication: within the team, written and verbal communication can both be a source of confusion. Communication with clients is also important and veterinary professionals need to consider both whether they have been understood or whether the client will be able to remember the information they have been given once they get home.
- Teamwork: being able to speak up or question the actions of others in the team or interruptions while people are dispensing medicines, or calculating and drawing up drugs for anaesthesia
- Education and training: an adequate knowledge base is important and team members should have training in correct dispensing procedures and legal requirements to avoid errors
- Equipment and resources: whether the practice management system is, or even can be, set up to prevent some errors automatically (for example, not allowing the dispensing of paracetamol to a cat); whether the computer system has safety alerts; the way medicines appear in an electronic list and the standardisation of equipment such as infusion pumps can all affect the frequency of error
- Working conditions: time pressures and workload (consultation length, time allocated for doing repeat prescriptions); how the dispensary is arranged and whether it is kept tidy will impact the likelihood of errors being made
- Organisational factors: safety culture; shift patterns and rotas; priorities and how these are communicated.

It is also important to realise that humans have limitations.

Working memory can only hold a few pieces of information, and can be easily forgotten, especially if there are distractions or the task cannot be completed straight away. Cognitive bias, such as expectation bias, can lead to problems when double checking or picking up the wrong medicine (Shippey and Rutherford, 2020).

Specific situations

Anaesthesia

Anaesthesia accounts for a significant proportion of drug errors for a variety of reasons:

- Patients often need to receive several different drugs in rapid succession
- Medications are usually all drawn up ahead of time
- Drugs are often all in syringes in the same place

KEY POINTS

- Medication prescribing, dispensing and administration is a core activity in veterinary practice and errors are common.
- Medication errors can cause harm to patients and also have a negative effect on the people involved and the practice.
- Reporting of errors is key to understanding, learning and improving.
- Human error is inevitable, but the underlying causes of medication errors go much deeper and involve every part of the complex systems of veterinary practice.
- Certain situations, medicines and systems of working make errors more likely to occur.

- Some drugs may be ready 'just in case' they are needed
- In emergencies, quick action is needed and there is an added time pressure

Look-alike and sound-alike medicines

These are a certain category of medicines that are a particularly prevalent contributing cause of error because of their similarity of appearance or name when written or spoken. These errors accounted for around 25% of all medication errors in a review of incident reporting data from Linnaeus (2020):

- Intravenous fluid mix ups, for example using hypertonic saline instead of normal saline
- Different strength formulations of the same medicines, such as flea products or tablets of the same branded medicine
- Glass ampoules of injectable drugs, for example adrenaline, atropine, buprenorphine. These are also often replaced into the wrong box by someone else if unused. It is even harder to tell them apart when you think you know what it is because you've looked at the box.
- Injectable medicines that come in different strengths, for example Metacam dog/cat versions
- Small vials of injectable medicines that are often stored together, for example medetomidine, atipamezole, ketamine and methadone. It is very easy to pick up the wrong one out of several 10 ml vials in the cabinet.

Sound-alike examples

These are commonly confused, often as a result of mistaking a written instruction or label. They are frequently stored next to each other on dispensary shelves too, as these are often arranged alphabetically.

- Gabapentin/Galliprant
- Tramadol/Trazodone
- Vetmedin/Vetoryl
- Cardalis/Cardisure
- Cerenia/Convenia
- Metacam/Methadone
- Ciclosporin/Cyclophosphamide

Insulin

Because the precise dose is critical, even small errors in dosing can be serious. In addition, a practice will often stock different forms of insulin with a similar appearance could be confused, for example, the administration of neutral insulin rather than lente. The different types of insulin may come in different strengths and have their own specific syringes marked out in units; a recurrent error is the use of 100 unit/ml syringes for 40 unit/ml insulin (or vice versa).

Intravenous fluids

Intravenous medicinal fluids can have serious and even fatal consequences if administered incorrectly. However, their use is seen as routine so administration is often delegated to more junior members of the team. The most common mistake is giving the wrong rate of fluids, because of a lack of knowledge, a failure to consider comorbidities or mistakes made when setting up an infusion pump. It may also result from deliberate variation from the prescribed rate, for example slowing or increasing the rate so bag will last longer or finish at a convenient time, combined with a perception that this will not be clinically significant.

Intravenous fluids may be used to deliver medicines as a constant rate infusion. This can lead to errors, particularly when this information is not made clear to staff by a consistent system of communication and labelling. For example, if intravenous fluids containing added potassium are used to flush the line, the consequences could be fatal.

Conclusion

The possibilities for medication errors are enormous and it is arguably surprising that more errors do not occur. However, it is essential to consider how medication errors in veterinary practice can be reduced. The second article in this series will address systems of work designed to reduce medication errors.

Conflicts of interest

The authors have no conflicts of interest to declare.

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