

Hypotension under general anaesthesia in canine and feline neutering procedures: A Clinical Audit

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Francesca Pritchard NCert Anaes RVN

Introduction

I joined Putlands Veterinary Surgery as the Head Nurse in January 2023. During my first couple of months, I wanted to establish if there were areas where we could improve the care we provide as a practice to ensure we have the best possible patient outcomes.

My passion in veterinary nursing is anaesthesia, so I thought this would be a good place to start. I noticed a trend, particularly during our routine feline neutering procedures, that quite a few patients became hypotensive during anaesthesia, requiring intervention whilst under general anaesthetic (GA).

I wanted to explore this further, so, during one of our regular Quality Improvement (QI) team meetings, I suggested we perform a clinical audit to look at perioperative blood pressure in both cats and dogs having routine neutering procedures.

Aims of the clinical audit

The idea behind this audit was to look at the effects of our pre-medication protocols on blood pressure for all neutering procedures and to collect data from this to assess if any improvements could be made. We used the American Society of Anaesthesiologists (ASA) Physical Status Classification System¹ to determine the animals we included in the audit. All animals included were normal, healthy patients classified as ASA 1 and under 5 years old. They received a pre-operative health check including a blood pressure reading using a Doppler measuring machine, to ensure the patient was normotensive with a minimum pre-sedation systolic blood pressure of between 90-120mmHg.²

A target was set for all patients to maintain a mean arterial blood pressure (MAP) of at least 60mmHg during their anaesthetic.³

This is important because clinical evidence suggests a minimum value of 60mmHg is necessary to perfuse vital organs such as the brain, heart and kidneys. Hypoperfusion of these organs means that there will be inadequate oxygen delivery to the tissues and poor removal of waste products which could lead to organ dysfunction and shock.⁴

Actions

Upon deciding to perform this clinical audit, we held a meeting with the clinical teams to discuss the reasoning for the audit, what we would measure and how. I downloaded the clinical audit template from RCVS Knowledge to help plan the initial cycle of the audit and the repeated cycle once the change had been implemented.

The nursing team recorded all blood pressure monitoring on the patient's anaesthetic sheet. This data was then recorded on an Excel spreadsheet so the results could be clearly seen.

Patients included in the first audit received a standard pre-medication and followed our standard anaesthesia protocol of:

- Acepromazine (ACP) at a dose rate of 0.02mg/kg combined with methadone at a dose rate of 0.3mg/kg.
- Induction of anaesthesia with propofol at a dose rate of 6mg/kg for cats and 4mg/kg for dogs given to effect.
- All patients were maintained using isoflurane and kept at a surgical plane of anaesthesia appropriate for that patient and surgery.
- All parameters including temperature, heart rate, respiratory rate, mucous membrane colour and reflexes would be monitored to maintain an appropriate surgical plane of anaesthesia.
- Blood pressure would also be monitored throughout their surgical procedure using an oscillometric monitoring machine. This would monitor the systolic, diastolic and mean arterial blood pressure (MAP).
- All measurements were recorded on the anaesthetic chart.

The collected data revealed that in the first audit cycle where patients received ACP and methadone premedication:

- 42% of our total patients had an average MAP lower than 60mmHg after the first 5 initial blood pressure readings post-induction.
- Of these patients, 50% were cats and 38% were dogs.

Following team discussions, a change to the pre-medication was agreed upon and instigated. A re-audit was carried out to determine whether any improvements had been made.

- In the re-audit, patients received medetomidine combined with methadone. Medetomidine was given at a dose rate of 0.005mg/kg with the same dose rate of methadone at 0.3mg/kg.
- All other parts of our anaesthetic protocols remained the same, with propofol induction given to effect, isoflurane used for maintenance and continued vital signs and blood pressure monitoring as before.

Results

During the re-audit cycle where patients received medetomidine and methadone premedication:

- 11% of our total patients had an average MAP lower than 60mmHg after the first 5 initial blood pressure readings post-induction.
- Of these patients, 0% of cats and 15% of dogs.
- A number of these patients also required reduced propofol for induction.

The results showed an improvement in the incidence of hypotensive patients during anaesthesia when a premedication of medetomidine and methadone was used. This audit suggests a link to hypotension with the use of ACP as a premedication in anaesthetised patients.

It must however be noted that many patients who had a medetomidine and methadone premedication required a decrease in the amount of propofol induction agent, and this could also have had an effect on blood pressure.⁵ This will need to be looked into further.

Impact of intervention

This QI initiative has had a positive impact in practice for both patient care and clinical team knowledge and our ability to adapt to change.

The results showed that a change from our pre-medication protocol of ACP and methadone to medetomidine and methadone decreased the number of patients having hypotension during anaesthesia. This meant that fewer patients were at risk of developing the side effects associated with hypoperfusion of the vital organs.

The team decided to continue using the medetomidine and methadone pre-medication in all anaesthetics for surgical procedures (unless a patient had comorbidities that suggested the use of an alternative sedative medication).

This audit did come with challenges, one of them being the difficulty of obtaining pre-operative blood pressure measurements with the Doppler machine in patients who were relatively anxious/stressed when admitted. Although the nursing team tried to obtain blood pressure readings during a pre-operative health check in all patients, it was decided to assess the need on a case-by-case basis if it caused too much stress. Some patient's blood pressure recordings were considered hypertensive during this pre-operative stage, and this was suggested to be linked with stress as long as all other parameters were considered normal. Before carrying out this audit, it was not routine to perform pre-operative blood pressure readings in patients and embedding this change required regular reminders. It must be noted that the team have not continued this action post-audit as it was felt it took up a lot of time and maybe caused excess unwanted stress in patients before their pre-medication.

We have noticed that the recovery stage of the anaesthetic with dogs and cats having the medetomidine and methadone premedication has been variable, with some patients experiencing more excited, or unpredictable recoveries. This means we take an individual approach to the patients and discuss whether a reversal agent is required before administering it.

When I first suggested this audit during my first QI meeting, the team present in the meeting were very on board with this suggestion. I decided to champion this audit but once the audit had begun, there was some resistance from some members of the team during the initial cycle. I think the resistance was mainly due to some members of the team worried about potential change and me being a new member of the team. One member of the nursing team was a little confused about the audit process and why we were doing it, so I decided to have a nurse meeting to discuss this further and encourage more support from the team to engage in this audit. The meeting allowed for questions to be answered and better clarification around the audit process and the improvements we are striving to achieve. After this meeting, there was more engagement from the nurses and a subsequent increase in the recording of the perioperative blood pressures on the anaesthetic charts. Nurses were also better at preparing equipment for blood pressure to be taken on admission to ensure smoother checks and trying to reduce stress in patients.

Results were delivered to the team after the first audit cycle and hearing the high number of patients developing hypotension during anaesthesia encouraged the team to want to improve.

Since completing this audit, we have had a couple of other members of the team wanting to complete further clinical and non-clinical audits which are strongly encouraged. The team are

more supportive of each other, and this shows we are all keen to strive for the best possible patient care.

Summary

Clinical audit is a process for monitoring standards of clinical care to see if it is being carried out in the best way possible, known as best practice.

A clinical audit can be described as a systematic cycle. It involves measuring care against specific criteria, taking action to improve it, if necessary, and monitoring the process to sustain improvement. As the process continues, an even higher level of quality is achieved.

What the clinical audit process is used for

A clinical audit is a measurement process, a starting point for implementing change. It is not a one-off task, but one that is repeated regularly to ensure ongoing engagement and a high standard of care.

It is used:

- ⇒ To check that clinical care meets defined quality standards.
- ⇒ To monitor the changes made to ensure that they are bringing about improvements and to address any shortfalls.

A clinical audit ensures concordance with specific clinical standards and best practices, driving improvements in clinical care. It is the core activity in the implementation of quality improvement.

A clinical audit may be needed because other processes point to areas of concern that require more detailed investigation.

A clinical audit facilitates a detailed collection of data for a robust and repeatable recollection of data at a later stage. This is indicated on the diagram wherein in the 2nd process we can see steps 4, 5 and 6 repeated. The next page will take you through the steps the practice took to put this into practice.

The veterinary clinical audit cycle

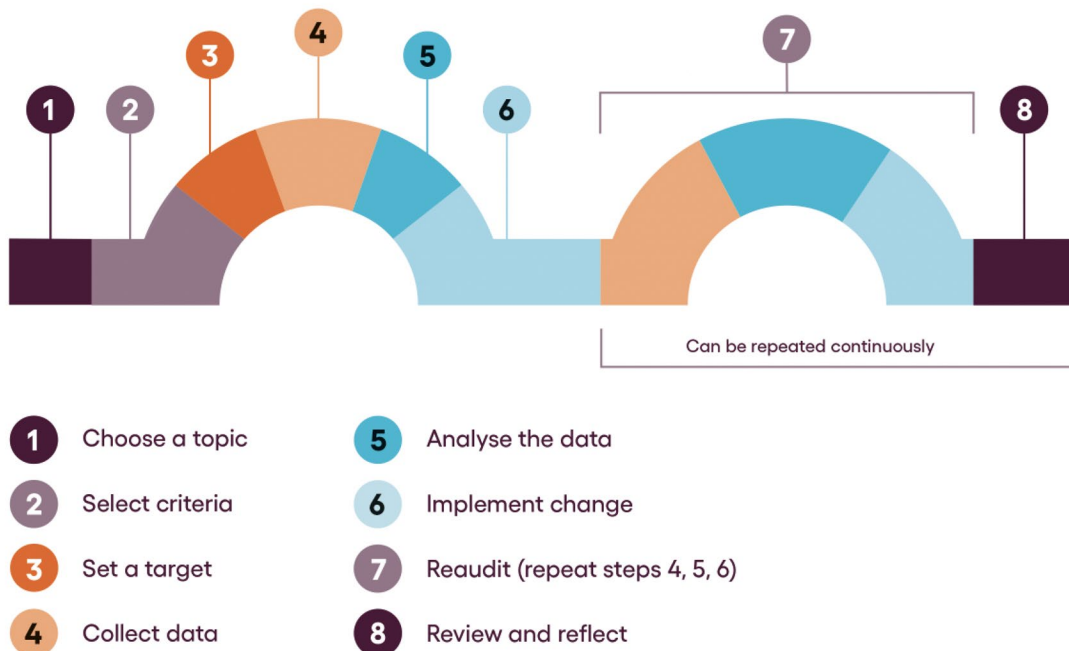


Figure 1: The Veterinary Clinical Audit Cycle by RCVS Knowledge. Available from www.rcvsknowledge.org. Developed by the Royal College of General Practitioners www.rcgp.org.uk/qi-ready

1. Choose a topic relevant to your practice

The topic should be amenable to measurement, commonly encountered and with room for improvement. The team decided to look at the blood pressure readings of patients during general anaesthesia in routine neutering procedures to assess if improvements to the number experiencing hypotension could be made.

2. Selection of criteria

Criteria should be easily understood and measured. Patients included in this audit were classed as ASA 1 and under 5 years of age. All patients received a pre-operative health check including blood pressure readings to ensure they were fit and healthy and considered normotensive.

3. Set a target

Targets should be set using available evidence and agreeing best practices. The first audit will often be an information-gathering exercise, however, targets should be discussed and set. The target was for all patients to maintain a mean arterial blood pressure (MAP) of 60mmHg during their anaesthetic procedure to maintain normal vital organ perfusion.

4. Collect data

Identify who needs to collect what data, in what form and how. Prospective data was collected by the nursing team for all canine and feline neutering patients included in the audit via pre-operative and peri-operative blood pressure monitoring recorded on the patient's anaesthetic charts.

5. Analyse

Was the standard met? Compare the data with the agreed target and/or benchmarked data if it is available. Note any reasons why targets were not met. These may be varying reasons and can take the discussion from the entire team to identify. The initial audit found that 42% of the total patients had an average MAP lower than 60mmHg after the first 5 initial blood pressure readings post-induction. Of these patients, 50% were cats and 38% were dogs.

6. Implement change

What change or intervention will assist in the target being met? Develop an action plan: what has to be done, how and when? Set a time to re-audit. The team discussed, agreed on and implemented a change to using medetomidine instead of ACP in the pre-medication protocol for patients classed as ASA 1, under 5 years of age and considered normotensive. All other parts of the anaesthetic protocol remained the same.

7. Re-audit

Repeat steps 4 and 5 to see if changes in step 6 made a difference. If no beneficial change has been observed then implement a new change and repeat the cycle. This cycle can be repeated continuously if needed. Even if the target is not met, the result can be compared with the previous results to see if there is an improvement. The repeat audit showed that 11% of the total patients had an average MAP lower than 60mmHg after the first 5 initial blood pressure readings post-induction. Of these patients, 0% of cats and 15% of dogs.

8. Review and reflect

Share your findings and compare your data with other relevant results. This can help to improve compliance. The audit and interim results were discussed at whole team and nurse meetings to share results and encourage engagement with the audit. The team are now looking to identify other areas for improvement.

References

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