Introduction

There are several factors in this case that support the case for modification of anaesthetic protocol for the benefit of the patient. Putting a geriatric animal under general anaesthesia always increases the risk for the animal due to reduced organ function. A nineteen year old cat will not be able to cope in the same way with pressure on the cardiovascular, respiratory, nervous, hepatic and renal systems as a young, healthy animal. There may also be other age-related diseases to be aware of such as osteoarthritis which although may not have been specifically diagnosed, may exist in a mild form. Confusion and delirium are also common in geriatrics in the recovery period, perhaps due to the effects of pre-medication drugs and maintenance agents and a slower metabolism of them (Murrel & Ford-Fenleh, 2011).

This patient was diagnosed two years ago with chronic renal failure. As it is not a recent diagnosis, it could be presumed that the symptoms are under control, due to drug therapy, dietary management and treatment of any underlying cause. However, these

Best practice anaesthesia for an elderly cat with renal failure under-going a dental procedure

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patients will require a higher fluid intake than normal and the ability to drink freely will be disrupted by general anaesthesia. They are also likely to be hypokalaemic and hypertensive (Gear & Mathie, 2011). It is important to control these conditions during anaesthesia as they could have detrimental effects on organ systems if not managed correctly.

Despite this, it could be argued that the procedure provides the least support for modification of anaesthesia. Although a dental procedure requires general anaesthesia, it is not in itself usually a complicated or dangerous procedure depending on the seriousness of the tooth decay and/or gingivitis. In a healthy animal with the beneficial aid of mandibular nerve blocks, patients often make a swift and smooth recovery.

If the patient makes an uncomplicated recovery from anaesthesia, the prognosis is likely to be good. Once the procedure is over, any suspected pain can be controlled using analgesic drugs — not Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), due to their negative effect on the kidneys which are already compromised in this patient (Lloyd, 2013) — and unless there have been tooth removals, there will be no wounds to heal. Supportive measures such as fluid therapy and oxygen therapy can also continue into the recovery period.

Anticipated problems
The American Society of Anaesthesiologists (ASA) anaesthetic risk for this patient would be class 3, due to the fact that the severe systemic disease and chronic renal failure, limits normal function of the kidneys and produces symptoms in the animal, such as polyuria, weight loss and hypertension (Welsh, 2009). There are many anticipated problems due to the fact that the clinical signs associated with chronic renal failure are often serious and need to be kept at a normal level. The ASA anaesthetic risk only takes into account disease factors so whilst being an elderly patient does increase her anaesthetic risk, it does not necessarily increase her ASA class.

The patient could become dehydrated due to a physical inability to take in water whilst under anaesthesia. Plasma potassium concentration is also likely to be low due to increased urinary loss of potassium through polyuria and this can affect the respiratory and cardiovascular systems, which are already compromised in anaesthesia (Murrel & Ford-Fennes, 2011).

Blood pressure must also be maintained at a normal mean arterial level of >70mmHg in order to reduce the deterioration of renal function postoperatively. If it is reduced, there will be an increased pressure on the cardiovascular system and if it is not quickly rectified, the patient could go into shock. Potential problems are increased due to the advanced age of the cat which will already have reduced respiratory and cardiovascular function.

Renal disease such as chronic renal failure can also cause hypoalbuminaemia as protein will be lost through the kidneys. This can mean there will be more active drugs in the blood, so doses should be lowered in order to prevent an overdose. It is also important to remember that some drugs are metabolised by the kidneys and they may consequently take longer to be excreted, therefore increasing the ‘hangover’ period post-operatively.

Pre-operative preparation
One of the most important aspects of pre-operative preparation for this patient is fluid therapy. This is to support glomerular filtration rate and stable urea and creatinine plasma concentrations which conscious animals usually maintain by drinking and urinating (Murrel & Ford-Fennes, 2011). When under anaesthesia, the patient will be unable to manually alter their fluid intake and output so providing supportive fluid therapy helps to maintain hydration. It also provides a facility for supplementation of potassium chloride due to the patient’s tendency to be hypokalaemic because of the renal disease. This is because of an increased urinary loss of potassium. However it is important to manage amounts correctly as an overdose of potassium supplementation could be dangerous. It is important also to remember that animals with chronic renal failure often have high blood pressure and we should be careful not to amplify this by over-hydrating the patient. How much potassium should be supplemented will depend on the animal’s current serum potassium concentration. An intravenous catheter should be inserted before the surgery and attached to the supplemented fluid (crystalloid) bag to ensure the patient is adequately hydrated before the surgery. The longer before the surgery that the patient is on fluid therapy, the more benefits there are; this could even mean admitting the patient the night before the surgery to ensure optimal hydration.

Blood products should be readily available as they may need to be used in case of severe anaemia or haemorrhage. This can result in a failure to deliver oxygen to tissues which can have serious consequences, such as shock or even death. Although this risk is reduced because of the nature of the surgical procedure (dental), risks and their consequences should not be underestimated, especially in a compromised patient. Blood typing for the cat should be done prior to surgery so that the surgeon feels confident that they can request blood products should they be needed.

Discussion with the owner before surgery should result in an awareness of general health of the patient. The patient needs to be eating well as anorexia and lethargy are frequently seen clinical signs in chronic renal failure (Gear & Mathie, 2011). If this is not the case, an alteration in diet may be needed, to provide more protein and fat (for appetite). Specific prescription diets such as Hill’s k/d which helps to reduce workload for the kidneys and maintain low blood pressure is a good option (Hill’s, 2014). It should also be remembered that this patient should be subject to normal pre-anaesthetic protocols as for a healthy patient undergoing any procedure. This includes pre-anaesthetic blood and urine tests, medical history and physical examination as a minimum.

Pre-anaesthetic blood and urine tests will give an indication of what may be considered ‘normal’ for a patient with chronic renal failure. We would expect to see increased blood urea nitrogen (BUN) and creatinine, due to a failure to excrete them by the kidneys and there may also be increased phosphorus and calcium. These are normal findings in animals with chronic renal failure. Urine is likely to be dilute due to an increased consumption and excretion of fluid, with some protein and/or bacteria present (Washington State University, 2009). All other results from the blood tests should be within normal ranges. If they are not, more tests may be required to be sure that it is safe for the procedure to go ahead or the procedure may need to be delayed to make sure the patient’s general health is adequate. Renal blood flow is of utmost importance to patients with chronic renal failure. The kidneys receive approximately 25% of cardiac output and their ability to function properly depends on this (Weil, n.d.). Packed cell volume (PCV)
of blood should also be assessed to check dehydration and anaemia, which can tend to be more prevalent in renal disease. These should be corrected before surgery. A normal reading would be between 27-50% for a healthy cat (Lane, Guthrie, Griffith, 2008).

Medical history will show how the disease has progressed in the patient since they were diagnosed two years ago and also if there is any previous unrelated disease that may still have effects on their health. It can also show how the patient reacted and recovered to any previous general anaesthesia and if there have been complications before. This is very important as it allows veterinary staff to be given an advanced warning of complications that could arise. It also gives a chance to talk through each organ system with the owner, as they may be able to provide information that they did not know was important or relevant to the procedure.

A physical examination is essential for every animal undergoing anaesthesia. It is likely that the body condition score for this patient would be low as weight loss is a clinical sign for this disease. Elderly patients also tend to have less lean body muscle and more fat which means there will be a lower blood volume and smaller quantities of drugs may be required. Thinner animals are more at risk for hypothermia and hypoglycaemia due to their large surface area to volume ratio which needs to be taken into consideration (Welsh, 2009). In order to reduce the anaesthetic risk in this situation, thought should be given to reducing fasting times to two to three hours as well as providing a warm environment during the pre-operative period. This could be through use of a heat mat with a good layer of towels or blankets to prevent burns to the patient.

Dehydration should be assessed as this may result in electrolyte imbalances, potassium being the most important but also calcium and sodium. When providing fluid therapy, Lactated Ringers Solution (LRS) would be an ideal fluid due to the addition of supplemental electrolytes. As already discussed, potassium-supplemented fluid therapy should be started before surgery to allow the body to adjust and rehydrate if necessary. However, patients can then be at risk for hyperkalaemia due to over-supplementation so it is important to carefully monitor the patient’s electrolytes by doing pre and post anaesthetic blood tests.

**Premedication**

Pre-medication protocols for this patient would include a sedative and pre-emptive analgesia. The sedative will calm the patient and hopefully provide a smooth transit in and out of anaesthesia. Pre-emptive analgesia will contribute to a pain-free and stress-free recovery. An effective premedication will also reduce the amount of induction and maintenance agents needed which will put less strain on the kidneys to metabolise. Low doses are recommended in geriatric patients.

Acetromine (ACP) would be a good sedative to use as it has properties that work to the advantage of a cat with chronic renal failure (CRF). It acts as a good sedative but also antiemetic which can benefit the patient as vomiting and anorexia can be clinical signs of CRF. It also acts as a vasodilator which will reduce blood pressure, again, beneficial in patients with CRF that can tend to be hypertensive. This should also assist with fluid therapy in contributing to a normal blood pressure. However, it can increase the chance of hypothermia by causing dilation of peripheral blood vessels and reducing muscle tone which prevents shivering. This is important in a patient who is already heat-compromised by old age and poor body condition. It can also reduce stress and anxiety which prevent the release of catecholamines as a stress response which can then reduce blood flow to the kidneys.

As a partner to ACP, there should be an analgesic, especially as ACP contains no analgesic properties. NSAIDs should be avoided in animals with renal failure as they put great pressure on the kidneys through inhibiting the production of prostaglandins. Prostaglandins are essential for the maintenance of normal renal flow so if production is blocked, renal blood flow is reduced causing more damage to the kidneys (Lloyd, 2013). Therefore, a better option would be to use an opioid. These bind to opioid receptors around the body to reduce the perception of pain without reducing cardiac output. Morphine is the ‘gold standard’ opioid as it provides excellent analgesia and lasts three to four hours. Another opioid option more commonly used in cats is buprenorphine. It provides moderate analgesia but the effects last longer, around eight to twelve hours.

A diazepam/ketamine combination could also be used safely in patients with renal failure but it must be remembered that they contain no analgesic properties. Diazepam is more effective in older patients as it may not create the same excitement usually seen in younger, healthy animals. Ketamine is excreted unchanged by the kidneys in cats which can place unnecessary pressure on them. Alpha-2 agonists would not be recommended due to their causing a reduction in blood pressure and therefore blood flow which can have serious cardiovascular effects for geriatric patients. They also act as a diuretic which is not ideal in patients with chronic renal failure (Welsh, 2009).

Another protocol to consider, especially for a dental procedure in case of tooth extractions, is the use of local anaesthesia. This involves blocking facial nerves in the anterior part of the mandible as well as the rostral upper arcade, lip and nose. Bupivacaine is the most commonly used drug for this purpose. It has a slow onset of around 20 minutes but a duration of four to six hours which means that it contributes to peri-operative analgesia. It should be administered only when needed i.e. if tooth extractions are necessary and at the lowest possible concentration needed to have the desired effect (no more than 2mg/kg in cats) (Veterinary Technician, 2000). Use of local anaesthesia contributes to a multi-modal approach by using different drugs which act on different parts of the pain pathway. It should also allow a reduction in maintenance agent which offers benefits for the recovery period by providing a smoother and quicker recovery.

If it is possible, it is recommended to pre-oxygenate geriatric patients with 100% oxygen by mask for three to five minutes before the start of the surgery. This “fills the functional residual capacity of the lung with oxygen which acts as a reservoir in case of apnoea or respiratory depression at induction of anaesthesia” (Hughes, 2008). However, it should be remembered that this will be counter-productive if the patient struggles as they are likely to initiate a stress response causing cardiac output to increase, thus using up more oxygen than was supplied by the mask.

**Induction**

As soon as the pre-medication has had adequate time to set in, induction can begin. Intravenous (IV) injection is usually the preferred method as it produces a smooth induction into anaesthesia and it allows the
veterinarian to dose to effect. This is important given the compromised health and age of the patient. However, it does require good patient restraint and venous access which can depend on the temperament of the patient. Other induction techniques include intramuscular injection or mask induction. These would usually only be considered if IV injection shows to be too distressing for the patient as they have certain disadvantages such as not being able to dose to effect and in the case of mask induction, environmental pollution.

For this patient, propofol would be the drug of choice. It provides a smooth induction and rapid recovery and is widely used for IV induction. There are some undesirable side effects such as the potential for apnoea during the initial moments and some patients will experience occasional twitching of limbs. As with many other anaesthetic drugs, there will be some cardiovascular depression too. However, one main advantage for a patient with CRF is that it is metabolised through the lungs and liver which puts less pressure on the already compromised kidneys. A dose rate suitable for a healthy patient should be used; with a little bit more than this amount drawn up in case the actual dose is not sufficient. Dosing to effect means that only as much as is needed should be given, even if this is not the whole amount of what is considered to be an accurate dose. Although this is extremely beneficial when considering cardiovascular depression of a compromised patient, it is important to remember that the patient needs to be suitably sedated to enable smooth intubation. If the patient does not receive enough propofol, she may resist intubation or require extra propofol or maintenance agent (mask induction) to ensure she is at a suitable anaesthetic level. This can be more distressing to the patient and place more stress on the cardiovascular and respiratory systems which is not desirable.

Once intubated and connected to the anaesthetic circuit, the patient should be positioned appropriately for the dental procedure. This is usually laterally as it allows the veterinarian to focus on one side of the patient’s mouth at a time. Absorbent pads are usually placed under the patient’s head and neck to absorb any water from the dental machine instruments and prevent the patient from lying on wet towels which could increase chances of hypothermia. It may also help to place a rolled up towel under the patient’s neck to raise it slightly but making sure the head points down to allow fluid to drain from the cat’s mouth onto the absorbent pad. Care should be taken with the endotracheal tube to make sure that it doesn’t get in the way during the procedure, but also that it is always securely in the trachea and attached to the breathing circuit.

**Maintenance and Monitoring**

Once the patient is successfully induced and intubated, she should be attached to the anaesthetic machine and the depth of anaesthesia assessed by checking vital signs such as heart and respiratory rate, as well as reflexes and capillary refill time (CRT). An anaesthetic monitoring chart should be used throughout the procedure, even if it is only planned to be a short duration as it allows monitoring of trends and for other staff to see progression of the anaesthesia.

The patient should be maintained on an inhalational agent throughout the dental. This has one major benefit for a patient with reduced kidney function in that almost all of the agent is lung metabolised meaning very little burden on the kidneys or liver. Isoflurane would be the agent of choice as it is very stable and not very soluble, resulting in fast inductions, fast recoveries and fast changes in depth, which is ideal for a compromised patient. Older patients often require less inhalational agent to produce general anaesthesia and this should be kept in mind when deciding what percentage to keep the vapouriser at; it is always preferable for the patient to be too light and have the ability to deepen. In humans, this often relates to changes in the brain and an ageing central nervous system (CNS). The CNS is also responsible for a lack of temperature regulation which can result in hypothermia (Hughes, 2008).

Blood pressure should be checked to make sure the fluid therapy is appropriate and that mean arterial blood pressure is being maintained at >70mmHg for a patient with renal disease. Doppler machines only read systolic blood pressure which should be maintained at above 90mmHg (Murrell & Ford-Fenneh, 2011). A surgical intravenous fluid rate of 5ml/kg/hr is usually used to maintain adequate circulating volume to the kidneys. Blood pressure should be monitored ideally using a non-invasive technique such as a Doppler machine as dentals can be short procedures. The cuff and probe could be attached to a rear leg which means assessment wouldn’t get in the way of the surgeon doing the dental. The volume on the machine could be left turned up throughout the procedure for staff to be able to hear the patient’s heartbeat.

Oesophageal stethoscopes may or may not be useful during a dental procedure. While they usually allow for a patient’s heart rate to be checked without getting in the way of the surgeon, during a dental the surgeon is focused around the mouth which means it is probably not ideal. Instead, a normal stethoscope should be used to assess heart rate. Temperature should be monitored throughout to make sure she is kept at an appropriate temperature between 38-38.5 C (Lane, Guthrie, Griffith, 2008) and to alert monitoring staff if this is not the case. Rectal thermometers would be easiest to use in this case as they are monitored at the opposite end of the body to where the surgeon is working.

There are other monitoring techniques that may especially beneficial with a compromised patient. Pulse oximetry measures the percentage of oxygen bound to haemoglobin within arterial blood which is a way of detecting tissue hypoxia. Haemoglobin saturation should be >94% and the vet should be alerted if it drops below this. However, the probe should also be moved slightly to check that it is not a fault in the machine which can happen if the probe is left in the same place for too long. The probe is usually placed on the tongue but in the case of a dental where it could get wet and/or in the way, it would be better to place it on a different area of non-pigmented skin such as between the toes or ear pinnae. A pulse oximeter will also show the patient’s pulse rate but this should always be confirmed by listening through the stethoscope as well, in case of mechanical fault.

Capnography provides a measurement of carbon dioxide that is inspired and expired, therefore giving useful information on cardiovascular and respiratory function. End tidal CO2 is measured which can determine if the patient is becoming hyper- or hypocapnic which is important in a compromised patient.

Depending on the suspected length of the surgery, we could measure the patients urine output. This provides information about renal function which is especially important
in a patient with CRF. It is also advised for patient comfort when they are recovering from surgery as there have been fluids administered but no way for them to be excreted during the surgery. Normal urine production is 0.5-2ml/kg/hr. This could be by manual expression or catheterisation; however, it should be assessed whether the extra time needed under anaesthesia to place a urethral catheter is justified depending on the length of the actual procedure.

As soon as the patient is stabilised at an adequate depth of anaesthesia, the surgeon may be able to take a better look at the patient’s teeth to determine whether any will need to be extracted. This will allow a decision to be made on whether any local anaesthetic will be needed and when it should be administered if necessary. If it is not used, even though there will be tooth extractions, the monitoring nurse may notice an increase in heart and respiration rate at the time of removal caused by pain, similar to a surgical incision. However, in a compromised patient it would be ideal for the surgeon to already know whether there will be tooth removals so as not to prolong the anaesthesia. Having a plan will also reduce the likelihood of hypothermia occurring and reduce the depression on the cardiovascular and respiratory systems.

Once the surgeon has finished the dental, all wet towels and absorbable pads should be removed and replaced with dry towels. The isoflurane should be turned off, the circuit flushed with oxygen and the patient allowed to breathe 100% oxygen for five to ten minutes in order to clear as much maintenance agent from their system as possible.

**Recovery**

Once the patient has been extubated, she should be removed from the surgery and moved to a quiet place where she can recover. The most important thing is prevention of hypothermia as it can have serious consequences, even for a healthy patient. It causes a general central depressant effect which may prolong recovery time and reduce drug metabolism. The most important thing is prevention of hypothermia as it can have serious consequences, even for a healthy patient. It causes a general central depressant effect which may prolong recovery time and reduce drug metabolism. It can also cause negative effects on blood viscosity and platelet function as well as affect wound healing and increase the risk of postoperative infection (Welsh, 2009). It is always better to try to prevent hypothermia rather than dealing with it once it has set in. There are things that can be done throughout the whole peri-operative period such as reducing surgery time where possible and use of heat mats (with adequate protection). Surgical clips and scrubs usually contribute to heat loss; this is not necessary for a dental but extra moisture around the mouth from a dental may have the same effect.

Thought should then be given to the recovery area, bearing in mind that it may need tidying and rearranging after the premedication period. Fresh towels and blankets should be laid down with some extras prepared for the head to lie. A heat mat may be used as long as wires are covered and the patient is checked regularly during the recovery period to make sure it is not being burned. The patient’s mouth and face could be wet from the dental procedure and it may be possible to gently wipe away excess moisture with a small towel or flannel. Consideration should also be given to allowing the recovery to take place somewhere visible and easily accessible. While it still needs to be quiet, this is a high risk patient in recovery and being easily visible means she can be checked and seen by many members of staff.

It would be useful to continue fluid therapy for several hours post operatively to provide maintenance hydration. This may mean turning down the fluid rate from a surgical rate to a maintenance rate of <5ml/kg/hour so as not to over hydrate. Serum potassium levels should also be monitored in the post op period and it may be necessary to switch the fluid bag if containing supplemental potassium, to one without that will just provide the patient with maintenance fluids and electrolytes (LRS) (Welsh, 2009). Blood pressure should also be checked every 15-30 minutes to ensure a stable recovery. It should be remembered that the patient may urinate because of the continuous administration of fluids and she should be checked regularly in case bedding needs changing. Urine output should be measured and urine specific gravity could also be checked using a refractometer. An adequate measurement in the cat would be between 1.020 and 1.040 (Lane, Guthrie, Griffith, 2008). Fluid therapy should be continued until the patient is awake enough to drink water unaided. Heart and respiratory rate should also be monitored throughout this period to make sure they are stable and normal for the patient.

Post-operative analgesia will be essential if there have been extractions, and should still be considered even if not in order to produce a smooth recovery. Again, the use of NSAIDs is contraindicated in patients with renal disease and so should not be used here. Opioids would be useful such as buprenorphine, making sure to take into consideration what time the premedication opioid was given so as not to overdose; it can provide approximately six hours of analgesia (Welsh, 2009). Pain will cause catecholamine release, vasoconstriction and decreased blood flow to the kidneys. It may be useful once the patient is fully recovered, or even a couple of days post op to perform more blood and urine tests to check that the patient is operating as it was before surgery and to make sure there are no post-op complications.

As she is an older patient, food should be offered to her as soon as she is awake enough to eat to prevent hypoglycaemia. What she is fed will depend on how much work was done during the dental, and she may even need to be syringe fed a watered down high nutrition food such as Hill’s a/d if she is unable to chew initially. This is a critical care diet, described by Hill’s as “nutritional support of pets recovering from serious illness, accident and surgery”. It also offers benefits such as highly digestible proteins for wound healing, extra potassium to avoid depletion and high palatability, useful for CRF patients experiencing anorexia (Hill’s, 2014).

Basic vital signs such as heart and respiratory rate, mucous membrane colour and capillary refill time should also be checked every 10-15 minutes initially, then every 30 minutes, to ensure a stable recovery. It is important to keep the geriatric patient quiet and relaxed to promote a smooth recovery as...
sympathetic stimulation can result in visceral vasoconstriction which can reduce blood flow to the kidneys.

Post-anaesthetic home care
Post anaesthetic care is very important in this patient and it is important to communicate this effectively with the owner. General anaesthesia post op care states that the patient should be kept in a warm, quiet place overnight and for the couple of days following the procedure. House rest is ideal, which should be relatively easy for the owner of a 19 year old cat to comply with.

Water should be freely offered with owners instructed to keep an eye on quantity drunk in case a larger volume needs to be left out or conversely, less than normal is drunk in which case the vet should be told as the cat may need to come back to the clinic for more supportive fluids. Fresh food should also be offered although it may be refused for the first 24 hours; this is normal after a general anaesthetic, especially in a dental, although local nerve blocks may have helped to prevent any localised pain in the mouth.

The owners should also be made aware if she has been given a pain relief injection following surgery as patients following routine dentals do not normally need any take–home pain relief. However, they should be made aware of behaviour that cats may exhibit when they are in pain such as anorexia, aggression and a lack of grooming (Murrel & Ford-Fenneh, 2011). However, these are also all clinical signs of chronic renal failure (aggression is linked to hyperthyroidism which is more likely in geriatric cats) and it may be hard for owners to distinguish between the ‘normal’ behaviour for the cat and pain behaviour. In this case, it could be suggested that the owners bring her back in two to three days for a post op check (which may be a free service offered by the clinic) for her vital signs to be assessed which may give any signs of pain from a physiological perspective.

In relation to her old age, she should be allowed plenty of chance to rest away from other pets or small children. She probably spends a large amount of her day sleeping usually and this may increase during the recovery period at home.

It is likely that due to her chronic renal failure, the patient will be on a modified diet that is formulated to maintain healthy kidney function and minimise the workload of the kidneys. This should be continued following surgery although it may be advisable to mix this with a diet specific for dental health. This will maintain dental health and ensure that the benefits from the procedure last longer. Transitioning to a new food should be done gradually with thought and discussion being given to how much of the old diet should be replaced with a new dental care diet.

When discharging the patient, the vet nurse should make sure they understand the procedure and know if any teeth were removed and if so, how many (sometimes owners will want to see them). Once the client arrives to pick up the patient, discharge information should be discussed before the cat is returned otherwise they may be too distracted to listen or understand properly. They should be reassured that they can call the clinic any time if they are concerned or have any questions and should be given the opportunity at time of discharge to ask questions. The post op check should also be arranged and booked in before they leave, where the vet staff can check the patient is recovering well and discuss any problems with the owner.

Conclusion
General anaesthesia in itself presents a risk to a healthy patient. Advanced age or renal disease are not contraindications to anaesthesia, but compromised patients do require modification of the anaesthesia protocols to ensure the safety and health of the patient. For a patient who is geriatric, risk increases due to a slower metabolism of drugs and reduced organ function. This means depression of the cardiovascular and respiratory systems will have more serious effects and they are also at a higher risk of becoming hypoglycaemic and hypothermic. For a patient who also has been diagnosed with chronic renal failure, even more pressure is put on the systems affected by anaesthesia, namely brain, heart, lungs, kidneys and liver. They are at more serious risk of hypokalaemia and hypertension which can affect other systems.

Careful consideration of drug therapy and fluid therapy are needed to ensure the patient’s system is not overloaded or compromised. With vigilant monitoring and preparation, veterinary staff can ensure that the risk is of anaesthetic complication is reduced as much as possible.

Reference List


Veterinary Technician (2000), Local Anaesthesia in Dogs and Cats.

