Strategic development of a chronic pain management plan based on level of discomfort

Anticipating, controlling and preventing pain in the geriatric patient of is of paramount importance and it comprises a cornerstone in the care we provide.

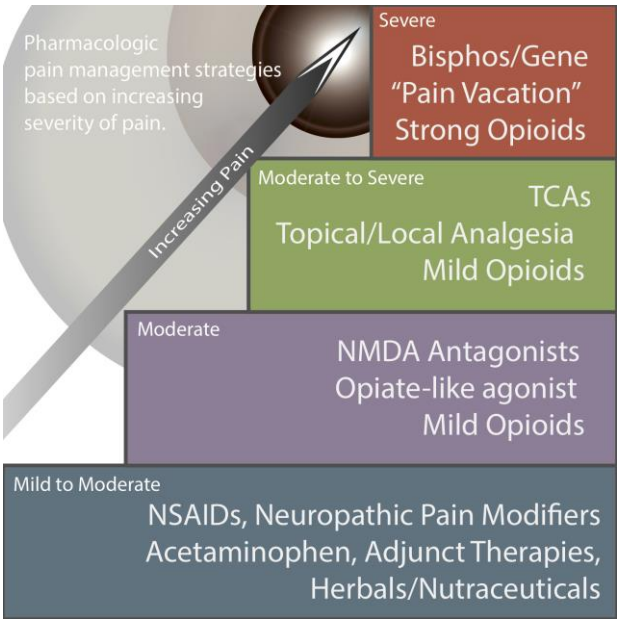
Effective and appropriate pain management considers the following: (1) early recognition and understanding of the clinical signs of pain, (2) anticipating the perceived level of pain experienced based on the disease process present, (3) implementing a multimodal pain management plan, and (4) the continued evaluation and reassessment of the response to treatments administered.

When managing pain in our geriatric patients, a preemptive multimodal approach should be used. With this approach, both pharmacologic and non-pharmacologic therapies complement one another, working far better together than what any single therapy can provide on its own. Preemptive therapy means the administration of pain medications if pain is anticipated or expected, as well as giving medications “around-the-clock” rather than “PRN” and waiting for overt signs of pain to be present.

Utilizing a multimodal approach allows for several things to occur simultaneously: (1) it allows for intervention at multiple places along the nociceptive pathway, (2) it increases the effectiveness of any given analgesic drug, and (3) and it allows efficacious use at lower drug doses (Gaynor 2015).

A multimodal pain management approach can include the use of anti-inflammatories, opioids, tricyclic antidepressants, anticonvulsants, NMDA receptor antagonists, nutraceuticals, herbal therapies and adjunctive physical modalities. The next 90-minutes will place focus on the “traditional” Western medications that can be used in various combinations to provide improved pain relief to our patients.

The following illustrates the medication strategy that I typically utilize for my chronic pain patients. It is a variation on the WHO pain ladder that reflects what I generally reach for first based on the anticipated level of pain. In this ladder, there is a layering of treatment modalities that can work synergistically together to provide optimal patient comfort. The medications are additive, meaning, one step builds upon the other, not takes the place of.



Utilizing this approach, the practitioner can layer treatment modalities that work

synergistically together to provide optimal patient comfort, and pharmacological protocols should be devised based upon the anticipated and/or perceived level of pain that is expected to be associated with disease.

The very bottom step represents mild to mild-to-moderate pain, and within the step are the medications that I typically start with in these situations. Mild pain to me would be the geriatric patient with a non-painful disease process, such as kidney disease, that has mild to moderate osteoarthritis as a comorbidity.

The next step up reflects moderate discomfort, and the additional medications that can be "layered on" to address the increasing pain. As we move up, the next step reflects moderate to severe pain, while to top step reflects severe to excruciating pain.

It should be noted that this continuum does not reflect hard and fast rules, only guidelines, because as you know, the experience of pain - and what strategy works for each individual patient - can be highly variable. The choice drugs used to treat pain will depend upon the underlying cause, the severity, the duration of time that pain is present, and the individual patient response.

Next I'd like to highlight some common disease processes that are typically seen in our hospice patients, along with the associated level of pain that can be anticipated with each one. Again, pain will vary according to many factors, especially the underlying severity of the disease that is present, which stresses the importance of assessing each patient individually. This list is by no means exhaustive, but I feel it is a pretty good start with regards to things we typically see in hospice settings. And having spent nearly 10 years on the human side of medicine, I can attest to the fact that this is pretty accurate based on what patients have verbalized to me regarding their own pain levels based on the diseases they've had.

Now we will move in to the layering strategies that I use for pain management, beginning with mild pain and working our way up through severe pain. Just to set the stage as we move forward, I'll begin with a general overview of the medications I reach for and then we will talk more about each drug individually.

PAIN LEVEL: Mild and Mild-to-moderate
MEDICATIONS TO REACH FOR: NSAIDs, Acetaminophen, Anticonvulsants, Adjuncts

Staring with pain that falls into the mild and mild-to-moderate category, the medications listed here are the ones I would generally reach for first, and include NSAIDs, non-opioid pain relievers, neuropathic pain modifiers, and adjuncts.

NSAIDs:
NSAIDs are an integral part of a balanced plan, and are effective in the reduction of pain associated with tissue inflammation. They work to reduce peripheral sensitization, and COX-2 specific NSAIDs may assist in reducing central sensitization as well. Since we are all very familiar with NSAIDs, I instead want to bring up a couple ancillary comments.

The first is that the best NSAID for any particular patient is the NSAID that is the most effective for that patient, while providing minimal or no adverse effects. I've had some patients respond better to Metacam over Rimadyl and vise-versa. The main point being, if one NSAID doesn't work, or AE are noted, you can always try another formulation before throwing in the NSAID towel.

A few notes of drug-drug interactions (DDI) with NSAIDs:

NSAIDs should be used with caution in heart failure patients who are taking Digoxin, ACE-I, or Furosemide. NSAIDs can increase the serum levels of digoxin leading to toxicity, and NSAIDs can reduce the diuretic effects of Furosemide as well as Furosemide increasing the risk of renal toxicity. ACE-I can potentially reduce RBF, and could also increase the risk of renal toxicity.

Tip: DDI checker @ drugs.com

With regards to concurrent disease processes, I want to address the use of NSAIDs in those geriatric feline patients with CKD; in dogs with renal disease, we have other options such as Galliprant (in the US) and acetaminophen. I have to say, that in geriatric situations, especially when quality outweighs quantity to owners, I do not hesitate to use NSAIDs following a very thorough family education and discussion of risk vs. benefit. I generally start at a modified or reduced dose of 0.1 mg/kg on day 1, then continue at a dose of 0.05 mg/kg EOD; if this doesn't help with OA signs, we will readdress risk vs. benefit and consider an increase in the dose to 0.05 mg/kg SID. A very good resource for additional information is the 2010 guidelines from the ISFM/AAFP regarding long-term use of NSAIDs in cats.

Acetaminophen:
Acetaminophen is a non-opioid analgesic and I love this medication for my canine geriatric patients - it has analgesic effects with no known anti-inflammatory or platelet effects (Boutaud, 2002) and thus, it can be used concurrently with NSAIDs or steroids or in those dogs that cannot tolerate NSAID use. While the precise mechanism of action of the analgesic effect remains uncertain, evidence suggests that its activity resides primarily in the CNS, through the expression of COX1b (formerly referred to as COX3), in comparison to the site of action for the analgesic effect of NSAIDs, which is predominantly peripheral (COX1 and COX2) within injured or inflamed tissues. When appropriately dosed at 10-15 mg/kg up to TID, it has a good safety record and can be helpful in the treatment of chronic pain. Several controlled clinical studies among patients with MS conditions, dental pain, or postoperative pain have shown that combinations of acetaminophen and NSAIDs provide additive pain-relieving activity, thereby leading to dose-sparing effects and improved safety (Altman, 2004).

And, as everyone knows, it is lethal in cats and should never be considered for administration in this species.

DDI to be aware of are when Acetaminophen is used with barbituates; e.g,. use with caution in your seizure patients taking phenobarbital as there is an increased risk for hepatotoxicity.

Acetaminophen should be used with caution in patients with liver disease. I assess liver disease (and my decision to use acetaminophen and NSAIDs) based on bile acid tests and not liver values, as they are not an adequate indicator of liver function itself. If owners are not able (or do not wish to) pursue bile acids, then we have a conversation that evaluates risk vs. benefit.

Anticonvulsants:
These drugs are helpful in our geriatric patients for the management of neuropathic pain, chronic maladaptive pain, and the prevention allodynia and hyperalgesia. Gabapentin is the gold standard drug in this category, with Pregabalin being another option, however the cost of

this drug generally limits its use despite some of the benefits that it has over gabapentin. Some of these benefits include its linear absorption, the fact that it can cause less sedation, and that it has more sustained plasma levels with BID dosing.

The mechanism of action of these drugs for its analgesic actions is not fully understood, but both of their effects are presumed to be from a binding to the alpha2-delta subunits of the calcium channels in the DHSC, where here, it decreases calcium influx and the release of the excitatory neurotransmitters— substance P, glutamate, and norepinephrine for example.

The recommended starting dose for Gabapentin is 5 – 10 mg/kg PO BID-TID; higher doses and frequency of administration (every 6-8 hours) are often needed. Sedation is a noted side effect that can be reduced by starting therapy at a lower dose and titrating upward to the desired pain-relieving effect.

The recommended starting dose for Pregabalin in dogs is 2 mg/kg PO q12h to minimize sedation, followed by titrating the dosage upwards in 1 mg/kg increments per week to 3 – 4 mg/kg PO q8-12h; there are anecdotal reports of pregabalin use in cats at 1 – 2 mg/kg PO q12h (Munana 2010).

Pregabalin has been shown in studies to provide equivalent efficacy to gabapentin, however, at much lower doses. Because lower dosages can be used to treat neuropathic pain, pregabalin if often associated with fewer dose-related adverse events.

Even though pregabalin and gabapentin share a similar mechanism of action (inhibiting calcium influx and subsequent release of excitatory neurotransmitters), the compounds differ in their pharmacokinetic and pharmacodynamic characteristics.

Pregabalin requires lower doses as it has a higher bioavailability and is rapidly absorbed (peak: 1 hr). Also, absorption is linear (first order), with plasma concentrations increasing proportionately with increasing dose. The same is not true for gabapentin. Gabapentin is slowly absorbed after oral administration (peak: 3 to 4 hours post-dose) and more importantly, orally administered gabapentin exhibits a saturable absorption - a nonlinear (zero-order) process - making its pharmacokinetics less predictable. Studies have shown that the bioavailability of gabapentin drops from 60% to 33% as the dosage increases from 900 to 3600 mg/day, while the bioavailability of pregabalin - which has a linear, first order process of absorption- remains greater or equal to 90% irrespective of the dosage used.

Both drugs can be given without regard to meals. Neither drug binds to plasma proteins. Neither drug is metabolized by nor inhibits hepatic enzymes that are responsible for the metabolism of other drugs. Both drugs are excreted renally, with elimination half-lives of approximately 6 hours.

Sedation is the main noted side effect for both of these medications, and I avoid this by staring therapy "low and slow." And even though takes a little longer to achieve the full pain relieving effects, I have found that in starting this way, it nearly guarantees that I am at least able to get an effect because the owners won't be scared off by the sedation.

I have also found that in my geriatric patients, when utilizing a multimodal approach, that doses of 5-10 mg/kg BID-TID are generally where they land and stay. I have had some outliers that were on doses of 50-75 mg/kg TID, but this is more rare in my experiences.

Of last note, there is a commercially available human oral solution (Neurontin®), but it should be avoided in dogs as it contains 300 mg/mL xylitol. The threshold dose that can cause hypoglycemia in dogs is approximately 100 mg/kg, and doses of up to 15 mg/kg in dogs using the solution should be safe, but it is best to avoid this formulation as compounding pharmacy are an available option.

DDI to consider with gabapentin use:
Oral antacids given concurrently can decrease bioavailability by 20%; if antacids are used, separate dose by at least 2 hours. Hydrocodone, which I use a lot of, may increase the AUC of gabapentin and (on the positive side) increase the efficacy, but on the same note, also increase the adverse effects of the drug; on the flip side, gabapentin can also reduce the AUC of hydrocodone, potentially reducing the drug's effectiveness. So, something to keep an eye on when monitoring response to therapies if these 2 drugs are used concurrently.

As far as concurrent disease processes, GP is eliminated via renal routes and dose adjustments may need to be considered in patients with renal insufficiency. With that said, in dogs, however, GP is also metabolized 30-40% so dose adjustments may not be needed in dogs with mild to moderate renal dysfunction. One reference recommends doses be reduced and/or dosing intervals be increased when creatinine clearance is 0.7 ml/kg/min or less (Trepanier, 2013).

Adjuncts:
As we have already touched upon, herbal therapies, nutraceuticals, and physical modalities can, and should be, incorporated to the pain management plan. The list of modalities are many and are beyond the scope of our time.

PAIN LEVEL: Moderate
MEDICATIONS TO REACH FOR: NMDA Antagonist, Opiate-like agonist, Mild Opioids

We will continue to move up the steps to address additional medications that can be added on to the bottom stair to address moderate pain. For example, if my patients are not responding to the trifecta of NSAIDs +/- acetaminophen, GP and adjuncts (Adequan (polysulfated glycosaminoglycan)/Cartrophen (pentosan polysulfate)), then I will usually next reach for an NMDA Antagonist and consider pulse therapy of a mild opioid during acute flare-ups of pain or to get on top of wind up.

NMDA Antagonists:
The NMDA receptor provides a specific target in managing maladaptive pain, and NMDA antagonists are effective adjuncts to NSAIDS - and are especially helpful in canine patients with osteoarthritis or osteosarcoma. Amantadine does not provide analgesic effects as a sole therapy, but may enhance the analgesic effects of NSAIDs, opioids, and gabapentin. It produces its effects when pain or central sensitization if already present, and it is not expected to decrease an acute pain stimulus.

Amantadine is the most commonly used drug in this category and it comes in 100 mg capsules. The recommended dose in dogs and cats is 2-5 mg/kg once daily, and I try to start at the lower end of the dose and slowly increase as needed. With regards to the once daily dosing, it should also be noted that Amantadine has a significantly shorter half-life in dogs and cats (~ 5.5 hrs) when compared to people (~ 15 hrs), and so twice daily dosing may be more effective. A Recent study by Butch KuKanich (Outpatient Oral Analgesics in Dogs and Cats Beyone Nonsteroidal Antiinflammatory Drugs: An Evidenced-based Approach) discussed this in detail.

I have seen some pets become agitated with this medication when first starting it, which, like GP, is usually self limiting and will resolve after a few doses - but because of this, I make sure I let owners know this can potentially be noted, and I generally start by giving a once daily dose in the morning (where restlessness is not as noticeable) for a few days, then increase to BID is needed, which is often the case.

This medication is rather costly; for the past several years, the price has been about $185 for a bottle of 100, although, as of time of this writing, the price dropped to ~$50/bottle and I'm unsure of how long it will stay at this price-point. There is an inexpensive oral solution available, but I have found that it is not palatable to most patients. Amantadine can be compounded into liquid or chews for smaller patients, which still often remains unpalatable, so I will often compound this specific medication into capsules.

Methadone is listed here, which I only reach for with the use of emergency comfort kits, or for when my patients are experiencing an acute flare up of moderate to severe to severe pain. However, I do mention methadone here because it has mild to moderate NMDA receptor Antagonist activity in addition to being a pure mu opioid. We will talk more about Methadone when we reach our top steps.

A note of DDI: amantadine can increase the stimulatory effects of selegiline, and thiazide diuretics may decrease the excretion of amantadine, yielding higher blood levels.

Amantadine should be used with caution in patients with liver, renal or heart disease, and dose adjustments may be needed. In these situations, I start with the lowest end of the dose, and give SID for 7-14 days, then consider an increase if no adverse effects are noted. I've yet to have issues (other than agitation [rare] or diarrhea) when used in patients with these underlying disease processes.

Opiate-like agonists:
Tramadol is an opiate-like agonist, and although I personally rarely use it in my patients, it can have its place in a multimodal approach to pain management.

As I am sure you are all aware of by now, unlike in cats and humans, Tramadol has little to no pain relieving effects in dogs, and there has been a lot of discussion around its use in the management of pain. This is because the opioid effect of tramadol is related to its major metabolite, O-desmethyltramadol (or M1), and the opioid analgesic effects of tramadol are derived from the active M1 metabolite. In recent studies, however, it has been discovered that dogs make very negligible amounts of the M1 metabolite, and instead, mainly make the metabolites (N,O-di-desmethyltramadol) M5 and (N-desmethyltramadol) M2. This has lead to the conclusion that, in dogs, most of tramadol's activity is actually derived from its serotonin and noradrenergic activity, not from opioid activity (Giorgi, 2009).

Additionally, while the dosing interval in cats is 12 hours, tramadol has been shown to have an exceptionally short half-life in dogs - about 1.7 hours - and therefore must be dosed ideally every 4 hours to be efficacious.

Other considerations around tramadol include the fact that the maximum analgesic effects may be delayed up to 14 days for chronic pain conditions, and it has also been found that long-term efficacy of tramadol may decrease with time; there are studies that the plasma levels diminish rapidly - to the point of being pretty much non-existent - in some dogs after 7 days of use.

For these reasons, I reserve tramadol for its calming/sedating effects, utilizing it as a periodic add-on medication during a time of increased discomfort or restlessness.

Potential DDI for tramadol include: MAO inhibitors may lead to serotonin syndrome, effects may be decreased by cyproheptadine, ondansetron may reduce efficacy of both ondansetron and tramadol when used concurrently, SSRIs can inhibit metabolism of tramadol decreasing efficacy and increasing risk of toxicity, and may be increased risk of seizures if using TCAs (additionally, amitriptyline specifically may inhibit tramadol metabolism).

Because tramadol has caused seizures in humans, it should be used with caution in animals with preexisting seizure disorders or receiving other drugs that may decrease seizure threshold. Patients with impaired renal or hepatic function may need dose adjustments.

Mild Opioids:
Mild opioids are used for moderate pain, and buprenorphine is the one more common mild opioids used. Buprenorphine is a partial u-agonist that also has a ceiling effect, meaning neither adverse side effects nor analgesia become more pronounced at higher doses, and in fact, the analgesic effect may actually diminish at higher doses as it displaces endogenous opioids off of u-receptors and elicits an apparent k-antagonist effect (Gaynor 2015).

Main advantages to buprenorphine are its relatively long duration (6-12 hours) and the fact that there is good data to support its use in cats.

As previously mentioned, I generally utilize a mild opioid for breakthrough pain, but I do have many hospice/geriatric patients that remain on it BID-TID daily, and this is what is needed to control their discomfort. This patient population generally includes pets with cancer (such as early to mid SCC or mandibular/nasal tumors), or those with debilitating arthritis that need an extra layer for breakthrough pain. Although I mainly use it in cats, I do use it OTM in small dogs as well. Dr. Ko did a study in 2011 that concluded that 0.12 mgs/kg of buprenorphine buccally, prior to a spay surgery, was an effective analgesic.

When it comes to larger canine patients, I will instead oftentimes provide O's with a few pre-loaded syringes to have on hand to administer SQ/IM if there is an acute exacerbation of moderate pain.

With regards to DDI, in addition to respiratory depression with other classes of medications, anticonvulsants may decrease plasma levels.

All opiates should be used with caution in patients with hypothyroidism, severe renal insufficiency, Addison's, or when severely debilitated. RARELY, patients may develop respiratory depression from buprenorphine and it should be used at lower doses (to start) in patients with compromised cardiopulmonary function. Patients with severe hepatic dysfunction may eliminate the drug more slowly. Buprenorphine may increase bile duct pressure and should be used more cautiously in patients with biliary tract disease.

Butorphanol is mentioned, but because of its short duration of action (20 minutes to less than 1 hour), and its lack of significant analgesia, it makes for a poor pain management choice. The reason it is included here, is because I have found that some hospice/geriatric patients benefit from its sedating effect, and can sometimes help to resolve restlessness and assist in achieving a continuous sleep at night, which is sometimes needed for both patient and O.

PAIN LEVEL: Moderate to Severe
MEDICATIONS TO REACH FOR: TCA's, Topical analgesia, Mild Opioids/Combination Medications

As pain increases, or if it is inadequately controlled, you can then begin to layer on additional medications such as TCA's, topical analgesia, or combination medications.

Tricyclic antidepressants :
TCAs are particularly helpful for neuropathic pain syndromes. They have a postulated action via serotonin and norepinephrine reuptake inhibition at nerve endings in the spinal cord and brain. The most commonly used TCA in animal patients is amitriptyline, which should be combined with other analgesics, as it is not generally efficacious when used alone. Of other note, if you are using Tramadol in your patients, this medication should be used cautiously to avoid serotonin syndrome.

DDI of note with amitriptyline in the geriatric patient include: concurrent use of thyroid agents can lead to an increased risk of arrthymias, cypoheptadine may antagonize effects of amitriptyline, cissapride may have an additive effect on QTc intervals and serious arrhythmias may result, MAO inhibitors can have life-threatening serotonin syndrome and concurrent use is not recommended.

Amitriptyline should be used with extreme caution in patients with seizure disorders, and with caution in patients with thyroid disease, urinary retention, hepatic disorders, KCS, glaucoma, cardiac rhythm disorders, diabetes, or adrenal tumors.

Topical analgesia:
Lidoderm patches can be very helpful at reducing pain, and I find them especially useful in my patients with OSA. Lidoderm patches are 10 x 14 cm self-adhering patches that come in a strength of 5%. The patch works to provide a differential blockage of the a-delta and c-fibers, but leaves the a-beta fibers alone, meaning, it blocks pain but not the sensation of touch.

The Lidocaine is embedded into a foam pad, so unlike a fentanyl patch that has a gel reservoir, it can be cut into any shape or size that is needed. There is significant absorption into the skin, but only scant systemic absorption making it suitable for both species. Patches can be left in place for up to 5 days, and help provide a nice sustained level of local analgesia during this time.

Of biggest note, is that they must be secured in a manner that the patient cannot remove or ingest; whole patch contains 700mg lidocaine and swallowing a patch could lead to enough systemic absorption to cause death. Even though the patches are self-adhering, I have often found that an additional form of attachment is needed, just like with a fentanyl patch, such as a light wrap or bandage.

Combination medications:
Combination medications are available, and they are something I use very frequently in my canine geriatric pain patients. Acetaminophen is commonly co-administered with opioids, such as codeine, hydrocodone, and oxycodone.

Although the bioavailability of the opioid component is reported to be low due to a robust first-pass effect, these combination medications are not without usefulness and are very helpful in my experiences.

The most common one I use is Acetaminophen 325 plus hydrocodone 10mg (which is Vicodin, or the generic name Norco), followed by acetaminophen + codeine, and these will be the two I'll talk about in most detail.

Studies evaluating the oral bioavailability of hydrocodone in dogs have shown variable reported results - approximately 40–80% of the bioavailability that is reported in humans – but do indicate it is absorbed systemically following oral administration. Hydrocodone is mu opioid agonist that is metabolized to hydromorphone, with hydromorphone concentrations persisting to at least 8 hours after 0.5mg/kg dose PO (KuKanich). I dose this medication at 1 tablet per 20 kg of body weight up to TID, and they can easily be quartered with good precision, allowing their use in dogs as small as 5 kg.

A couple comments about codeine. The oral bioavailability of this has been found to be low in dogs, about 4% compared to about 60% in humans. Codeine in dogs does not significantly metabolize into morphine as it does in people, however, dogs do produce another u-agonist metabolite, codeine-6-glucoronide in significant quantities, and it is this that is thought to render the analgesic effect. It has been recommended for use in dogs at a dose of 1.1–2.2 mg/kg PO q 6–12 hours.

PAIN LEVEL: Severe
MEDICATIONS TO REACH FOR: Strong Opioids, "Pain Vacations"

Severe pain is a place we hope our geriatric patients never get to. However, if they do begin to encroach upon this area or experience moments of severe pain, we can utilize stronger opioids and also consider other modalities such as bisphosphantes for OSA or a mini pain vacation for an acute exacerbation pain under certain circumstances.

Strong opioids:
There are several strong opioids available for parenteral use in our geriatric patients. The one that I use most often is methadone, but there are many other considerations.

Methadone, a mu-agonist, acts similarly to morphine with regard to its degree of analgesia and duration, but has the added benefit that it is also is an inhibitor of NMDA receptors. It can also reduce re-uptake of norepinephrine and serotonin, which may further contribute to its analgesic effects. Due to these additional actions, I feel methadone is a better option for acute on chronic pain than morphine.

I also prefer methadone because it is more sedating, which is an added benefit, especially when it is being used as a comfort kit or prior to euthanasia; I also don't see the vomiting with administration that I will often see with morphine, and lastly, if the patient is a cat, O's can give it OTM if they prefer that to SQ injections, and efficacy is usually at least 4 hours with that route. Oral methadone is not recommended in dogs because it has low bioavailability and a very rapid clearance.

To me, the only downside of methadone is its cost - which is about $560 per 20 ml bottle. With regards to its high cost, I simply charge families accordingly, and I have yet to have a finanical

loss or bottle expire. If families cannot understandably afford methadone, then morphine is a very viable option.

Hydromorphone is another strong opioid, and has the same efficacy as morphine in dogs; additionally, it is thought produce better analgesia than morphine in cats, but there is a higher incidence of hyperthermia. In dogs, duration of hydromorphone is shorter than morphine, about 1-2 hours after IV administration and only up to 2 hours after IM or SQ administration, however, in cats, hydromorphone may have a longer duration of action, potentially up to 7 hours. Hydromorphone is associated with less histamine release, nausea, and sedation compared to morphine.

With regards to the stronger opioids, there are also oral formulations available that can be used. In addition to hydrocodone and codeine that were previously discussed, there is also the availability of hydromorphone (Dilaudid), and sustained-release forms, including morphine (MS Contin), oxycodone (Oxycontin), and oxymorphone (Opana ER).

I haven't been as happy with oral morphine in my patients compared to the other options available. It has a very low absorption (less than 20% bioavailable in the dog) and the sustained-release oral products have been shown to have highly variable absorption rates. Dosing recommendations in dogs is 1 mg/kg PO q4-6h, and in cats, 0.5 mg/kg BID-TID. However, other sources do not recommend its use in cats.

Sustained-release morphine is used in dogs at 2 – 5 mg/kg PO twice a day, and if using, be sure to educate your clients not to break or crush the tablets under any circumstances as crushing turns sustained-release morphine into immediate-release, which can result in overdose and death.

The usefulness of highly potent oral opioids such as oxycodone and oxymorphone is not well established, and due to diversion potential, you may only wish to use these on a last resort basis. Oxycodone has been subjectively shown to efficacious in dogs at a dose of 0.1 to 0.3 mg/kg PO twice to 3 times a day and may induce less sedation and dysphoria than morphine. Oxycodone dose has not been described in cats.

All opiates should be used with caution in patients with heart failure, hypertension, and severe debilitation.

Pain Vacation:

A pain vacation would be a day-long hospitalization (for example, 8 hours) with a CRI of sub anesthetic ketamine +/- an opioid and +/- lidocaine depending upon the severity and type of pain.

The purpose of its use is to get on top of windup pain that can occur with certain disease processes, or as an effective rescue for an acute, severe exacerbation of pain. An instance where I have used this, was for a patient that had an aggressive and severe case of cutaneous mast cell disease and she would get extreme flare ups of pain and subsequent anxiety. This intervention was needed to control her pain until she could be seen by her oncologist the following day, because the owner did not want her admitted to a hospital setting overnight. In

this particular instance, it was discovered on MRI that her MC disease actually spread to her spine causing these symptoms.

When we are utilizing ketamine in this way, it is not being used as a general anesthetic at higher doses, but instead being utilized it for its potential to mitigate pain at sub-anesthetic doses. Because ketamine is an NMDA antagonist, and because that receptor is a critical link in the establishment of wind up pain, it works to help with central sensitization and calm down the pain that is being experienced. So, *while it is not an analgesic*, it is very effective as an "anti-hyperalgesic and an anti-allodynic" treatment. Studies have shown an improvement in discomfort and windup when a CRI of ketamine was continued for as little as 6 hours.

The sub anesthetic dose is accomplished by adding 60 mg of ketamine to 1 L of fluids and running it at a rate of 1 ml/lb/hr. An initial bolus should be given to rapidly reach plasma levels. Then, based on the type and severity of pain present, you can add in other analgesics such as morphine and/or lidocaine to achieve the level of comfort needed.

Conclusion:
The ability to be able to strategically provide adequate pain management is hands-down one of the most rewarding aspects of care that we can deliver to our patients. Being able to utilize various classes of medications, and taking advantage of their synergy with one another, will help the practitioner to provide optimal comfort and quality of life in the geriatric years.

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