

Perianaesthetic Analgesic Guidelines

For Companion Animal Veterinary Practice – Dosing Guide Summary



Opioids

Opioids are listed on the World Small Animal Veterinary Association (WSAVA) list of essential medicines for cats and dogs^{1,2} and remain the cornerstone of acute and perioperative pain management in dogs and cats due to their efficacy, ease of administration, and relative safety.¹

Morphine – 🌶️🌶️🌶️

- Pure mu agonist.
- Onset of analgesia: 10-15 minutes IV and 30 minutes IM.
- Routes of administration, dose and frequency:^{1,3}

Dogs	Cats
IM: 0.3-0.5 mg/kg every 2-4 hours	IM: 0.3-0.5 mg/kg every 4-6 hours
IV: 0.1-0.2 mg/kg every 2-4 hours*	IV: 0.05-0.2 mg/kg every 4-6 hours*
CRI: (0.1 mg/kg IV load) 0.1-0.3 mg/kg/hr	CRI: (0.05 mg/kg IV load) 0.05-0.2 mg/kg/hr

* Histamine release can occur after rapid IV injection. Dilution and slow IV administration is recommended.

- May also be administered via the intra-articular, epidural or intrathecal route (preservative free formulations for the latter only). Doses typically range from 0.1-0.2 mg/kg.

Methadone – 🌶️🌶️🌶️

- Pure mu agonist, non-competitive inhibitor of N-methyl-D-aspartate (NMDA) receptors and can reduce re-uptake of norepinephrine and serotonin.
- Onset of analgesia: <10 minutes IV and 15 minutes IM.
- Routes of administration, dose and frequency:^{4,5}

Dogs	Cats
IM: 0.3-0.5 mg/kg every 2-4 hours	IM: 0.2-0.5 mg/kg every 2-4 hours
IV: 0.1-0.2 mg/kg every 2-4 hours	IV: 0.1-0.2 mg/kg every 2-4 hours
CRI: (0.2 mg/kg IV load) 0.1 mg/kg/hr	CRI: (0.1 mg/kg IV load) 0.05-0.1 mg/kg/hr^

^ Clinical recommendation as no published studies currently available.

Fentanyl – 🌶️🌶️🌶️

- Pure mu agonist.
- Onset of analgesia: <10 minutes IV.
- Routes of administration, dose and frequency:^{1,6}

Dogs	Cats
IV: 2-5 µg/kg every 20-30 minutes	IV: 1-3 µg/kg every 20-30 minutes
CRI: (2-5 µg/kg IV load) 3-6 µg/kg/hr*	CRI: (2-5 µg/kg IV load) 2-5 µg/kg/hr*
Transdermal patch: ^Y	Transdermal patch: ^N
< 10 kg	< 10 kg
10-20 kg	25 µg/hr patch
20-30 kg	50 µg/hr patch
> 30 kg	75 µg/hr patch
	100 µg/hr patch

* Doses can be increased for inhalant anaesthetic-sparing effect or for maximum analgesia. For example, intra-operative doses of up to 20 µg/kg/hr for cats and 40 µg/kg/hr for dogs. If these higher doses are used, it is imperative that clinics use capnography and have access to ventilatory support due to the significant risk of associated respiratory depression and apnoea.

^Y Transdermal patches in dogs reach therapeutic plasma concentration in approximately 24 hours and are maintained for 72 hours following patch placement.

^N Transdermal patches in cats reach therapeutic plasma concentration in approximately 12 hours and are maintained for 72 hours following patch placement.

In general, pure mu agonists (e.g. morphine, methadone) provide better analgesia than partial mu agonists (buprenorphine) or mu antagonist-kappa agonists (butorphanol).

Buprenorphine 🌶️ – 🌶️🌶️

- Partial mu agonist, with many of the same actions as the pure mu agonists. Dose related analgesia may be provided up to a ‘ceiling,’ the dose beyond which analgesia is not necessarily enhanced with increasing the dose rate.
- Onset of analgesia: 30-45 minutes for IM or IV; may be slightly be longer for oral transmucosal (OTM) route (in cats).
- Routes of administration, dose and frequency:^{1,7}

Dogs	Cats
IV or IM: 0.01-0.04 mg/kg every 4-8 hours	IV, IM or OTM ^A : 0.02-0.04 mg/kg every 4-8 hours

^A OTM route may be suitable as “hands-off” analgesia in cats, when part of a multimodal analgesia plan with regular pain scoring.

Butorphanol 🌶️

- Kappa agonist and mu antagonist.
- Onset of action: < 15 minutes IV (effect is mainly sedation with limited analgesia provided).
- Routes of administration, dose and frequency:³

Dogs	Cats
IV, IM: 0.2-0.4 mg/kg every 2-4 hours	IV, IM: 0.2-0.4 mg/kg every 2-4 hours
CRI: (0.1 mg/kg load) 0.1-0.2 mg/kg/hr%	

% for sedation only and in dogs, not cats.

Opioid Reversal Agent : Naloxone

- Antagonist (competitive) at mu, kappa and delta opioid receptors. The AVAAAP recommend that all clinics who use full mu agonists should also stock naloxone.
- Onset of action: < 2 minutes IV.
- Duration of effect: approximately 20 minutes.
- Routes of administration, dose and frequency:⁶

Dogs	Cats
IV, IM: 0.04 mg/kg every 20-60 minutes ^⓪	IV, IM: 0.04 mg/kg every 20-60 minutes ^⓪

^⓪ In painful patients, 1 vial (0.4 mg/mL) can be diluted in 10 mL of saline. The solution can then be titrated slowly to effect to reverse the undesirable opioid-related effects but avoiding complete antagonism of the analgesia.

The AVAAAP recommend that all clinics routinely using opioids, particularly full mu agonists, should also stock naloxone.

The Opioid “Spice Scale”: Which Opioid Should I Choose?

The following key has been used to help guide the recommended opioid choice based on the anticipated amount of pain, but remember regular pain scoring should always guide dosing intervals and dose rates.



Indicated for
non-painful to mildly
painful procedures



Indicated for
moderately painful
procedures



Indicated for up to and
including severely
painful procedures

“Regular pain scoring should always guide opioid dosing intervals and dose rates.”

NSAIDs

NSAIDs are a reliable tier 1 analgesic⁸ for the management of acute inflammatory pain in dogs and cats. Combining NSAIDs with opioids represents the ideal approach to multi-modal pain management in the perioperative setting.

Carprofen

- Preferential COX-2 inhibitor.
- Peak blood levels: PO: 1–3 hours^{9,11}; SC: 2.5 hours (dogs).¹¹
- Routes of administration, dose and frequency:^{9,11}

Dogs	Cats
IV, SC: 4 mg/kg PO: 2–4 mg/kg/day	IV, SC: 4 mg/kg ONCE ONLY PO: tablets not registered for use

Meloxicam

- Preferential COX-2 inhibitor.
- Peak blood levels: SC: 1.5 hours in cats; 2.5 hours in dogs.¹²
- Routes of administration, dose and frequency:^{7,12}

Dogs	Cats
IV, SC: 0.2 mg/kg SC/IV; after 24 hours can be followed with 0.1 mg/kg/day PO	SC: 0.3 mg/kg ONCE ONLY OR PO: 0.05 mg/kg/day (with no SC administration) ⁸

⁸ Off-label dosing of meloxicam in cats at 0.2 mg/kg SC injection, followed 24 hours later by 0.05 mg/kg PO once daily for up to 4 days has been recommended by an international consensus of veterinary anaesthetists.⁷

Robenacoxib

- Selective COX-2 inhibitor.
- Peak blood levels: SC: 90 minutes (dogs); PO: 30 minutes; do not give with food.¹³
- Routes of administration, dose and frequency:¹³

Dogs	Cats
SC: 1–2 mg/kg ONCE; after 24 hours can be followed on with PO dosing 1 mg/kg for up to 12 days	SC: 1–2 mg/kg ONCE; after 24 hours can be followed on with PO dosing 1 mg/kg for up to 6 days

NSAIDs are appropriate for use across the spectrum of mild to severe pain as part of a multi-modal analgesia approach. Regular pain scoring should be used to assess for adequate patient response.

Alpha-2 Adrenoreceptor Agonists

Alpha-2 agonists provide reliable dose-dependent sedation, analgesia and muscle relaxation. They interact synergistically with opioid receptors in the CNS, enhancing analgesia when combined with opioids and can provide effective analgesia for major surgeries when combined with pure mu-agonist opioids.^{14–20}

Medetomidine

- Onset: IV: 5 minutes; IM: ~10 minutes.^{20–25}
- Peak effects: IV: 15–30 minutes; IM: 30 minutes.^{20–25}
- Duration of effect: dose-dependent; typically 30–90 minutes sedation; analgesia 50–80% of duration of sedation.^{17,19,23–30}
- Routes of administration and dosage:^{15,16}

Medetomidine (continued)

Dogs	Cats
IM: 3-15 µg/kg	IM: 5-20 µg/kg
IV: 2-10 µg /kg	IV: 5-10 µg/kg
CRI: 0.5-1 µg/kg/hr [®]	CRI: 0.5-1 µg/kg/hr [®]
Intraoperative IV bolus: 1-2µg/kg [~]	Intraoperative IV bolus: 1-2µg/kg [~]

[®] Dilution is required and a syringe driver is highly recommended. Diluting medetomidine to 5 µg/mL for cats and small dogs and 10 µg/mL for larger dogs is useful.

[~] If IM boluses are being used intraoperatively, rather than IV boluses, the lower end of the IM ranges listed above are recommended.

Alpha-2 agonists exhibit allometric scaling, whereby larger animals require lower doses for equivalent effects compared with smaller animals.

Dexmedetomidine

- Onset: IV: 5 minutes; IM: ~15 minutes.^{20–25}
- Peak effects: IV: 15–30 minutes; IM: 30 minutes.^{20–25}
- Duration of effect: shorter duration than medetomidine, also dose-dependent; typically 30–90 minutes sedation; analgesia 50–80% of duration of sedation.^{17,23–30}
- Routes of administration and dosage:^{15,16,31}

Dogs	Cats
IM: 2-10 µg/kg	IM: 2.5-10 µg/kg
IV: 1-5 µg/kg	IV: 2.5-6 µg/kg
CRI: 0.25-0.5 µg/kg/hr [™]	CRI: 0.25-0.5 µg/kg/hr [™]
Intraoperative IV bolus: 0.5-1 µg/kg ⁺	Intraoperative IV bolus: 0.5-1 µg/kg ⁺

[™] Dilution is required and a syringe driver is highly recommended. Diluting dexmedetomidine to 2.5 µg/mL for cats and small dogs and 5µg/mL for larger dogs is useful.

⁺ If IM boluses are being used intraoperatively, rather than IV boluses, the lower end of the IM ranges listed above are recommended.

During the first 30 minutes after IM administration, both sedation scores and analgesic response were greater following medetomidine compared with dexmedetomidine.^{17,23–30}

Alpha-2 Reversal Agent: Atipamezole

- Competitive antagonist of centrally and peripherally located alpha-2 adrenoreceptors.^{23,29}
- Onset: IM: ~6 minutes.³⁰
- Half-life twice that of medetomidine, so resedation unlikely, but may impair repeat dosing with dex medetomidine.²⁰
- Effectively reverses sedative and analgesic effects of dex/medetomidine, but only partially reverses cardiorespiratory effects.^{23,24}
- Routes of administration and dosage:³²

	Dogs	Cats
Medetomidine reversal	5x that of medetomidine dose OR equal volume [#]	2.5x that of medetomidine dose OR half the volume [#]
Dexmedetomidine reversal	10x that of dexmedetomidine dose OR equal volume [%]	5x that of dexmedetomidine dose OR half the volume [%]

[#]When formulated at 1 mg/mL medetomidine. [%]When formulated at 0.5 mg/mL dexmedetomidine.

Antagonism of dex/medetomidine with atipamezole will negate analgesic properties as well as tranquilisation. Antinociceptive properties may decline more rapidly than sedation.³⁰

See specific product labels for further information on dosage, specific precautions and contraindications.

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