The following pain management protocol is tiered to ensure a global relevance, recognizing that not all analgesic modalities are available to veterinary practitioners and vary from region to region around the world. Its implementation will be guided by the various analgesic modalities available along with the needs of the individual patient requiring treatment. This protocol is reproduced from the WSAVA Global Pain Treatise, a succinct yet comprehensive review of pain assessment, various pain modalities, and the treatment of various clinically painful scenarios in both dogs and cats. The WSAVA GPC Pain Treatise published in the *Journal of Small Animal Practice* and is available for open access at the GPC pages of **www.wsava.org**.

Emergency and critical care

In addition to analgesia for pain control, many injured or ill animals will require analgesia to facilitate restraint, diagnostic and emergency procedures. As each animal will present with varying levels of injury or illness and be experiencing different degrees of pain, individual drug selection, and dosing to effect is essential, rather than considering a standard regimen for all patients. Painful animals may also be aggressive and chemical restraint is required to protect staff, and the patient from further (self-inflicted or iatrogenic) injury, and to facilitate a physical examination. These animals may appear stable even with severe injury or illness (especially cats) due to the 'fight or flight' response. Where blood or fluid loss may be present or suspected, fluid therapy is commenced prior to careful titration of the opioid to avoid potential adverse effects with standard dosing.

The use of NSAIDs in the emergency patient should be withheld until the volume, cardiovascular and renal status of patients is determined to be within normal limits and with no potential for deterioration. NSAIDs should never be administered to patients with evidence of/potential hemorrhage.

Due to the variability of diagnoses, animals admitted for ongoing critical care experience a variable degree of pain, which contributes to a catabolic state in these patients. In addition to the primary problem, there are the additive effects of pain due to placement/presence of IV, urinary, thoracic and abdominal catheters and drains. Many patients undergo frequent manipulations and procedures also contributing to the overall pain experienced. When considering analgesic selection, potential adverse effects should be minimized due to the often compromised organ function of these patients. Opioid analgesics and ketamine can still be used in patients with renal and hepatic insufficiency. Initial low dosing of the analgesic titrated to effect is required to reach therapeutic levels and avoid adverse effects; however, ongoing dosing with adjustments will be dependent on the individual patient as metabolism and excretion will be reduced (see below). Analgesia must be withdrawn slowly to avoid an abrupt return to a hyperalgesic state should pain still be present. Where the re-appearance of pain is identified, return to the previous dose for several more hours followed again by slow withdrawal. Analgesia and the induction of restful sleep is the goal. Continuous rate infusions are useful to achieve this. The following drugs, approximate dosages and combinations, are suggested for moderate to severe pain. Initially, start with a lower dose of an opioid. Should further analgesia be required, add lidocaine (not cats), or ketamine if needed. Where drug availability is limited, select a regimen from the following based on availability:

For severe pain opioids alone will not be sufficient and higher dosages than those in the Table may be required. Should adverse effects begin but pain is still not controlled, introduce ketamine. Add lidocaine if ketamine cannot control the pain.

- ***Loading dosages****:* Titrate *the opioid slowly to effect first*, if needed add ketamine, if needed add lidocaine 2 mg/kg
- ***CRI:*** The continuous dosing regimen is based on the loading dose and expected duration of action. Clinical experience indicates that the fentanyl and ketamine loading dose can be used as the hourly infusion even though the expected duration of a single dose is ~30 mins. For hydromorphone, methadone and morphine, the effective loading dose can then be used as the CRI dose over a 4-hour period (divide by 4 for the hourly dose) with frequent assessment and modification as duration of action may be prolonged, especially where renal or hepatic dysfunction is present. Should the patient appear overdosed at any period of time, the CRI can be stopped for 30 minutes, or less if signs subside, and reinstituted at one-half the previous dose rate. Or, careful titration of naloxone to reverse side effects (unless an emergency < 0.002 mg/kg may suffice; higher doses may result in hyperalgesia, hyperexcitability, cardiac arrhythmias and aggression. Refer to Table 1 of the full Guidelines for instructions). Where there are no contraindications/compromised organ function for NSAID use, addition is recommended where pain cannot be managed.

Drug	Approx Loading Dose: titrate to effect	Approx CRI/time period based on loading dose
Fentanyl	2–5+ µg/kg	3–5+ µg/kg/h
Hydromorphone	0.04–0.05 + mg/kg	0.01–0.015+ mg/kg/h
Methadone	0.2–1.0 mg/kg	0.05–0.2 mg/kg/h
Morphine	0.3 mg/kg	0.1 mg/kg/h
Ketamine	0.2–2 + mg/kg	0.2–2 + mg/kg
Lidocaine	Dogs only 2 mg/kg	1–2 mg/kg/h

Where opioids are not available, lidocaine and ketamine as above, epidural anaesthesia, intrapleural or intra-abdominal local anaesthesia where indicated, diffusion catheters and various local blocks for post-surgical analgesia can be administered.

Anecdotally acupuncture has been used as an appropriate adjunct for the critically ill patient. There are minimal risks or side effects of acupuncture, although very debilitated patients may require fewer needles.

Other modalities to include in the critically ill patient are proper use of warmth for muscle spasm or pain, cold for regions of acute injury or inflammation, gentle pressure support for appendicular regions that are painful (or sometimes for abdominal pain). Furthermore, proper padding and positioning, patient mobilization and nursing care are critical for comfort in these patients.

For additional pharmaceutical dosing information, see the dosing tables in the WSAVA GPC Treatise at www.wsava.org

JSAP