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 Pain Committee guidelines, 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 Pain Committee Guidelines are published in the Journal of Small Animal Practice and is available for open access at the Pain Committee pages of **www.wsava.org.**

CAESAREAN SECTION

The physiologic changes associated with pregnancy influence the choice of anaesthetic and analgesic drugs for caesarean section in queens and bitches. All anaesthetic and analgesic agents cross the placental barrier. There is more evidence-based information on caesarean section and neonatal vitality and survival for dogs than cats. Premedication is normally recommended to decrease maternal stress and anxiety and to reduce the doses of induction and maintenance agents; in addition the use of opioids provides pre-emptive analgesia. Decreased gastrointestinal motility and the enlarged uterus increase the risk of vomiting and aspiration. Aspiration of gastric contents is thought to contribute to maternal mortality. For this reason if opioids are given preoperatively choose those that are less likely to cause emesis (e.g. buprenorphine, butorphanol, methadone and pethidine); intubation is always warranted to protect the airway and also for delivery of oxygen. Rapid control of the airway is essential therefore mask induction with an inhalant agent is not recommended. The administration of opioids prior to delivery has not been shown to adversely affect the outcome for the offspring. If opioids have been administered to the dam and the offspring are bradycardic, naloxone can be administered via the umbilical vein or sublingually. Due to their high oxygen requirements and reduced functional residual capacity of the lungs, pregnant animals are at risk for hypoxaemia and oxygen desaturation can occur rapidly at induction of anaesthesia. Pre-oxygenation (3–5 minutes) using a face mask is recommended. Many animals undergoing caesarean section are dehydrated and even in elective situations, fluid losses can be large therefore intravenous fluids are recommended and should be started prior to induction of anaesthesia.

Drugs that are known to increase maternal and/or neonatal mortality include the alpha2-adrenergic agonist xylazine and the inhalant agent methoxyurane. There is no data on the effect of the newer alpha2-adrenoceptor agonists (medetomidine and dexmedetomidine) on anaesthetic risk associated with caesarean section. However due to the potential for emesis and cardiovascular depression, these drugs as a class are best avoided. There is some controversy regarding the use of NSAIDs in this setting due to potential uptake and negative effects in the suckling offspring. However, only a small percentage of the dam's dose of NSAID is secreted in milk and a single post-operative dose is regarded as a suitable compromise. NSAIDS should only be given if hypovolaemia and hypotension have been corrected.

Elective situation

Preoperative: IM or IV opioid ± acepromazine (lower doses [0.01–0.03 mg/kg IM or IV] are usually sufficient). An opioid normally provides adequate sedation for venous access however acepromazine can be used if the dam is difficult to manage and requires more sedation than an opioid alone can provide.
Induction and maintenance of anaesthesia: IV alfaxalone to effect (3–5 mg/kg) or IV propofol to effect (3–10 mg/kg). Where propofol or alfaxalone are not available, ketamine or thiopentone could potentially be used with the understanding that they may decrease vigour of the offspring and resuscitation efforts should be aggressive. Following intubation, anaesthesia can be maintained with isoflurane.
NOTE: The dam's requirements for inhalant agents may be reduced by 25–40% at term. Anaesthesia can be maintained with repeated boluses or a continuous rate infusion of propofol, but intubation and administration of oxygen is still required.
Local anaesthetic techniques: Pre-incisional and / or post incisional line block (lidocaine or bupivacaine).
Epidural/ Spinal analgesic techniques: Morphine can be administered pre- or post-operatively to provide up to 18–20 hours of analgesia.
Postoperative analgesia: NSAIDs, one dose. Opioids can be continued.

Emergency situation with compromised dam

Preoperative: Fentanyl IV (3–5 µg/kg).

Induction: IV etomidate (1–2 mg/kg) ± diazepam or midazolam (0.25 mg/kg), IV ketamine (3–5 mg/kg) plus diazepam or midazolam (0.25 mg/kg); midazolam is shorter acting in both dam and offspring so is preferred when available.
*Maintenance:*Following intubation anaesthesia can be maintained with isflourane and fentanyl can be repeated.
Local anaesthetic techniques: See above
Epidural/ Spinal analgesic techniques: See above
Postoperative analgesia: NSAIDs should only be considered if the bitch or queen is normovolaemic and normotensive. Opioids can be continued.

Protocol without controlled drugs

Preoperative: Acepromazine unless the bitch or queen is volume depleted. If the dam is compromised do not administer premedication drugs.
Induction and maintenance of anaesthesia: IV alfaxalone to effect (3–5 mg/kg), propofol to effect (3–10 mg/kg) or etomidate (1–2 mg/kg). Following intubation anaesthesia can be maintained with isoflurane. Anaesthesia can be maintained with repeated boluses or a continuous rate infusion of propofol, but intubation and administration of oxygen is still required.
Local anaesthetic techniques: See above
Epidural/ Spinal analgesic techniques: See above
Postoperative analgesia: NSAIDs, one dose

Protocol with limited availability of anaesthetic and analgesic drugs

Preoperative: Acepromazine (see indication for use above).
Induction and maintenance of anaesthesia: Depending on availability of drugs, choose from the protocols above.
Local anaesthetic techniques: Epidural local anaesthetic (lidocaine) can be used as a sole technique but with caution.
NOTE: due to the decreased size of the epidural space in pregnant animals, smaller volumes (25–30% reduction) of epidural local anaesthetic drugs are used. Epidural local anaesthetics cause sympathetic blockade with resultant vasodilation and hypotension which can be prevented or treated with intravenous fluids, but could be especially detrimental in compromised dams. With this technique the dam is conscious and therefore not intubated so there is an increased risk of aspiration; oxygen should be administered by face mask. The dam will also require to be manually restrained for surgery.
Postoperative analgesia: NSAIDs one dose.

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

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Monteiro, B.P., Lascelles, B.D.X., Murrell, J., Robertson, S., Steagall, P.V.M. and Wright, B. (2023), 2022 WSAVA guidelines for the recognition, assessment and treatment of pain. J Small Anim Pract, 64: 177-254. https://doi.org/10.1111/jsap.13566