

DECREASING ANAESTHETIC MORBIDITY AND MORTALITY: RISK ANALYSIS AND MONITORING

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INTRODUCTION

Complications related to the delivery of anaesthesia are inevitable. The source of most anaesthetic complications is human error and is often in association with poor monitoring.

Critical incidents and accidents:

- Human error (70%)
- Equipment failure (13%)
- Organizational error

(Clarke & Hall 1990) stated that 1/679 (0.15%) healthy dogs and cats died primarily as a result of anaesthesia. Most of these deaths were attributed to the fact that the patient was not under close observation.

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RESEARCH PAPER

The risk of death: the Confidential Enquiry into Perioperative Small Animal Fatalities

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The risk of anaesthetic and sedation-related death in healthy patients (ASA 1–2) is currently estimated to be 0.05% and 0.11% in dogs and cats, respectively. Overall, 0.17% and 0.24% in dogs and cats respectively. 47% of dogs and nearly 61% of cats die during the postoperative period (mainly within 3h of termination of the procedure). Presumably, when patients were left unattended and unmonitored (Brodbelt et al. 2008). It has been postulated that causes such as airway problems, either intra-operative or post-operative, may have been implicated (Cooper 2007)

SPECIAL ARTICLE

Risk factors for anaesthetic-related death in cats: results from the confidential enquiry into perioperative small animal fatalities (CEPSAF)[†]

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(Brodbelt et al. 2007) Cats (ASA 1–2) have a two-fold higher risk of death than dogs. Postulated reasons include:

- Poorer preoperative assessment where more cats are misclassified as healthy when harbouring significant disease or anaesthetic-related death.
- Due to the generally smaller size they are more prone to hypothermia, pre-disposing to prolonged recoveries and increased morbidity (Waterman 1981; Dhupa 1995; Kurz et al. 1996).
- The reduced size could also predispose to overdosing of anaesthetics administered, particularly in patients that were not weighed.
- Endotracheal intubation
- Fluid therapy have been associated with increased risk of death in cats but not dogs (Brodbelt et al. 2006; Brodbelt et al. 2007). The technique is more difficult and laryngospasm or trauma more likely in cats than dogs, pre-disposing to perioperative complications (Hofmeister et al. 2007). It is also worrying that we have suboptimal airway management, as it has been found with trainee human anaesthetists (Whymark et al. 2006).

Results. Between June 2002 and June 2004, 175 deaths were classified as anaesthetic and sedation-related and 14 additional deaths (with insufficient information to be excluded) were included for the estimation of risk. During the study, 79 178 anaesthetic and sedation procedures were recorded and the overall risk of anaesthetic and sedation-related death was 0.24% (95% CI 0.20–0.27). Factors associated with increased odds of anaesthetic-related death were poor health status (ASA physical status classification), increasing age, extremes of weight, increasing procedural urgency and complexity, endotracheal intubation, and fluid therapy. Pulse monitoring and pulse oximetry were associated with reduced odds.

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Normal Values and Incidence of Cardiorespiratory Complications in Dogs During General Anaesthesia. A Review of 1281 Cases

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With 5 tables

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(Redondo et al. 2007) studied the incidence of complications during general anaesthesia in 1281 dogs:

- Hypoventilation (63.4%)
- Hypotension (37.9%)
- Bradycardia (36.3%)
- Hypoxia (16.4%)
- Hypothermia (4.8%)

Recent studies evaluating deaths where anaesthesia played a contributory role in human anaesthesia, documented risks of ~0.005–0.02% (Tikkanen & Hovi-Viander 1995; Eagle & Davis 1997; Suan et al. 1997; Biboulet et al. 2001; Kawashima et al. 2003). The introduction of modern instrumental monitors has halved the number of intraoperative cardiac arrests (Keenan et al. 1991) 52% of incidents were detected first by a monitor (Webb et al. 1993). A combination of pulse oximetry, capnography and blood pressure should detect 93% of serious incidents

INSTRUMENTAL MONITORING

It is not primarily a warning system to alert the anesthetist! Monitoring is used as part of a complex feed-back control system to keep the patient in a safe “*physiological envelope*” (Young & Griffiths 2006)

STANDARDS FOR BASIC ANESTHETIC MONITORING

Committee of Origin: Standards and Practice Parameters

(Approved by the ASA House of Delegates on October 21, 1986, and last amended on October 25, 2005)

STANDARD I

Qualified anesthesia personnel shall be present in the room throughout the conduct of all general anesthetics, regional anesthetics and monitored anesthesia care.

STANDARD II

During all anesthetics, the patient's oxygenation, ventilation, circulation and temperature shall be continually evaluated.

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ACVA Monitoring Guidelines Update, 2009

Recommendations for monitoring anesthetized veterinary patients

Position Statement

This shift toward minimizing anesthetic morbidity has been facilitated by more objective definition and earlier detection of pathophysiologic conditions such as hypotension, hypoxemia and severe hypercapnia. This has resulted from the incorporation of newer monitoring modalities by skilled attentive personnel during anesthesia.

However, as the standard of veterinary care advances and client expectations expand, revised guidelines are necessary to reflect the importance of vigilant monitoring. The goal of the ACVA guidelines is to improve the level of anesthesia care for veterinary patients. Frequent and continuous monitoring and recording of vital signs in the peri-anesthetic period by trained personnel and the intelligent use of various monitors are requirements for advancing the quality of anesthesia care of veterinary patients.

1. JAVMA 1995;206(7): 936-937.

- Biboulet P, Aubas P, Dubourdiou J et al. (2001) Fatal and non fatal cardiac arrests related to anesthesia. Canadian journal of anaesthesia = Journal canadien d'anesthesie 48, 326-332.
- Brodbelt DC, Blissitt KJ, Hammond RA et al. (2008) The risk of death: the confidential enquiry into perioperative small animal fatalities. Veterinary anaesthesia and analgesia 35, 365-373.
- Brodbelt DC, Hammond R, Tuminaro D et al. (2006) Risk factors for anaesthetic-related death in referred dogs. The Veterinary record 158, 563-564.
- Brodbelt DC, Pfeiffer DU, Young LE et al. (2007) Risk factors for anaesthetic-related death in cats: results from the confidential enquiry into perioperative small animal fatalities (CEPSAF). British journal of anaesthesia 99, 617-623.
- Clarke KW, Hall LW (1990) A survey of anaesthesia in small animal practice: AVA/BSAVA report. J Associ Vet Anaesth 17, 4-10.
- Cooper GM (2007) Confidential enquiries into anaesthetic deaths. British journal of anaesthesia 99, 606-608.
- Eagle CC, Davis NJ (1997) Report of the Anaesthetic Mortality Committee of Western Australia 1990-1995. Anaesthesia and Intensive Care 25, 51-59.
- Hofmeister EH, Trim CM, Kley S et al. (2007) Traumatic endotracheal intubation in the cat. Veterinary anaesthesia and analgesia 34, 213-216.
- Kawashima Y, Takahashi S, Suzuki M et al. (2003) Anesthesia-related mortality and morbidity over a 5-year period in 2,363,038 patients in Japan. Acta Anaesthesiol Scand 47, 809-817.
- Keenan RL, Shapiro JH, Dawson K (1991) Frequency of anesthetic cardiac arrests in infants: effect of pediatric anesthesiologists. Journal of clinical anesthesia 3, 433-437.

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- Redondo JI, Rubio M, Soler G et al. (2007) Normal values and incidence of cardiorespiratory complications in dogs during general anaesthesia. A review of 1281 cases. *Journal of veterinary medicineA, Physiology, pathology, clinical medicine* 54, 470-477.
- Suan C, Perez-Torres C, Herrera A (1997) Postoperative mortality in a general hospital. *Revista espanola de anestesiologia y reanimacion* 44, 267-272.
- Tikkanen J, Hovi-Viander M (1995) Death associated with anaesthesia and surgery in Finland in 1986 compared to 1975. *Acta Anaesthesiologica Scandinavica* 39, 262-267.
- Webb RK, Russell WJ, Klepper I et al. (1993) The Australian Incident Monitoring Study. Equipment failure: an analysis of 2000 incident reports. *Anaesthesia and Intensive Care* 21, 673-677.
- Whymark C, Moores A, MacLeod AD (2006) A Scottish National Prospective Study of airway management skills in new-start SHOs. *British journal of anaesthesia* 97, 473-475.
- Young D, Griffiths J (2006) Clinical trials of monitoring in anaesthesia, critical care and acute ward care: a review. *British journal of anaesthesia* 97, 39-45.