

RESEARCH PAPER

Adverse event surveillance in small animal anaesthesia: an intervention-based, voluntary reporting audit

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Abstract

Objective To develop, test and refine an 'intervention-based' system for the surveillance of adverse events (AEs) during small animal anaesthesia.

Study design Prospective, voluntary reporting audit.

Animals A total of 1386 consecutive small animal anaesthetics (including 972 dogs and 387 cats).

Methods Adverse events were defined as undesirable perianaesthetic events requiring remedial intervention to prevent or limit patient morbidity. Using previous reports, 11 common AEs were selected and 'intervention-based' definitions were devised. A voluntary reporting audit was performed over 1 year at a university teaching hospital. Data on AEs were collected via paper checkbox forms completed after each anaesthetic and were assimilated using an electronic database. Interventions were performed entirely at the discretion of the attending anaesthetist. Comparisons between dogs and cats were made using Fisher's exact tests.

Results Forms were completed for 1114 anaesthetics (a compliance of 80.4%), with 1001 AEs reported in 572 patients. The relative frequency of AEs reported were as follows: arousal or breakthrough pain (14.9%), hypoventilation (13.5%), hypotension (10.3%), arrhythmias (5.8%), hyperthermia/hypothermia (5.0%), airway complications (4.8%), recovery excitation (4.6%), aspiration risk (4.5%), desaturation (2.8%), hypertension (1.7%) and 'other' (3.7%). Canine anaesthetics (57.3%) were more likely to involve AEs than were feline anaesthetics (35.5%, $p < 0.01$). Escalation in postanaes-

thetic care was required in 20% of cases where an AE was reported (8% of anaesthetics overall). In 6% of cases (2% overall), this involved management in an intensive care unit. There were six intra-anaesthetic fatalities (0.43%) during this period. The tool was widely accepted, being considered quick and easy to complete, but several semantic, logistical and personnel factors were encountered.

Conclusions and clinical relevance Simple intervention-based surveillance tools can be easily integrated into small animal anaesthetic practice, providing a valuable evidence base for anaesthetists. A number of considerations must be addressed to ensure compliance and the quality of data collected.

Keywords adverse events, anaesthesia, audit, intervention, safety.

Introduction

The accurate reporting of adverse events (AEs) is regarded as a fundamental cornerstone of patient safety culture and the development of evidence-based practice (Cooper et al. 1978; Department of Health 2000; Kohn et al. 2000; Mellin-Olsen et al. 2010; Bell 2011; Gisvold & Fasting 2011). Despite this, large-scale studies investigating AEs in small animal anaesthesia are performed infrequently (Clarke & Hall 1990; Dyson et al. 1998; Gaynor et al. 1999; Redondo et al. 2007) with recent audits concentrating predominantly on reporting perianaesthetic fatalities (Brodgelt et al. 2008; Bille et al. 2012, 2014; Gil & Redondo 2013). This focus on fatality, although clearly important and relevant, inevitably slows the rate at which safety improvements can be made (Boëlle et al. 2000; Gisvold & Fasting 2011).

One major obstacle to large-scale audit is the lack of consensus over what to report and also how events should be defined and classified. This inconsistency means that data collected from individual studies are difficult to aggregate and compare, limiting efforts to produce evidence-based recommendations (Green & Yealy 2009). As a consequence, the development of uniform definitions and reporting templates has been recommended in human medicine (Cummins et al. 1991; Bhatt et al. 2009; Mason et al. 2012). Key examples of such templates are seen in the fields of cardiopulmonary resuscitation (the 'Utstein style') and sedation [the 'Quebec guidelines' and the World Society of Intra-venous Anaesthesia's International Sedation Task Force (ISTF) AE reporting tool] (Cummins et al. 1991; Bhatt et al. 2009; Mason & Green 2012).

Both the Quebec guidelines and the ISTF suggest moving away from a traditional 'event and threshold' approach to an 'intervention-based' system of AE definition and reporting. 'Event and threshold' definitions are based on a parameter reaching a specified critical threshold (e.g. mean blood pressure dropping below 60 mmHg could define hypotension). In contrast, the basis of 'intervention-based' definitions of AEs is whether or not remedial actions are made in response to a particular event with the aim of halting escalation and limiting consequences (e.g. an intervention such as a crystalloid or colloid bolus made in response to a drop in blood pressure could define hypotension). Despite appearing less intuitive and more subjective, reported benefits of this approach include providing a better reflection of the clinical relevance of AEs and more objective, unambiguous and reproducible data that can be more readily aggregated and compared (Bhatt et al. 2009; Green & Yealy 2009; Mason & Green 2012).

Our initial objectives were threefold: first, to develop and implement an intervention-based, AE surveillance tool in a university teaching hospital; secondly, to report its findings over a year-long pilot period; and, finally, to describe its evolution over the first year of reporting. The overall aim of the project was to suggest a potential template for a surveillance tool for veterinary anaesthesia by which readily comparable AE data could be captured in a wide-scale fashion.

Materials and methods

The study was designed as a prospective, voluntary reporting audit of small animal anaesthetic AEs using a purpose-built, intervention-based AE surveil-

lance tool. The study was approved by the local ethics and welfare committee as part of a larger study proposal (reference QVSH/CR41).

Development of the surveillance tool

Applying the principles set out in Bhatt et al. (2009) and Mason & Green (2012), AEs were defined as undesirable perianaesthetic events that required remedial intervention in an attempt to prevent or limit patient morbidity, mortality, distress or discomfort.

Using previous reports in the literature regarding AEs and complications in both human and veterinary anaesthesia, a reference list of AEs and interventions was drawn up (Cooper et al. 1987; Clarke & Hall 1990; Dyson et al. 1998; Gaynor et al. 1999; Callum et al. 2000; Redondo et al. 2007). This initial list was abbreviated by amalgamating individual AEs into broader categories (e.g. apnoea, respiratory arrest, hypoventilation and abnormal respiratory patterns into a single ventilation category). AEs were selected based on their reported frequency of occurrence (Clarke & Hall 1990; Gaynor et al. 1999) and on their general significance in terms of patient morbidity and mortality (as judged by the authors). Generic intervention-based definitions were developed for each of these AE categories using the definitions outlined by Bhatt et al. (2009) as a basic framework. Remedial actions, treatments, procedures or an escalation in the level of care were all considered as interventions. Some of the more serious events (such as hypoxaemia) also had a secondary component to their descriptors to assist in their assessment.

A total of 11 AEs were included in the predominantly checkbox-based surveillance tool, which was circulated on a single page of A4 paper on the reverse side of the anaesthetic pricing sheet used to bill for anaesthesia services. AE definitions, further descriptors and interventions associated with them are shown in Fig. 1. In addition, a number of free text areas and a section for AEs that did not fall into the main categories were provided. Finally, an outcomes section which included death, euthanasia and various potential escalations in the level of care that could be prescribed as a direct consequence of the AE(s) (above and beyond standard postanesthetic care for that type of procedure), was included.

Testing of the surveillance tool

A prospective, voluntary reporting audit of AEs encountered during small animal anaesthetics was

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