

RESEARCH PAPER

Systems analysis of voluntary reported anaesthetic safety incidents occurring in a university teaching hospital

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Q1 Abstract

Objective To identify factors contributing to the development of anaesthetic safety incidents.

Study design Prospective, descriptive, voluntary reporting audit of safety incidents with subsequent systems analysis.

Animals All animals anaesthetized in a multispecies veterinary teaching hospital from November 2014 to October 2016.

Methods Peri-anaesthetic incidents that risked or caused unnecessary harm to an animal were reported by anaesthetists alongside animal morbidity and mortality data. A modified systems analysis framework was used to identify contributing factors from the following categories: Animal and Owner, Task and Technology, Individual, Team, Work Environmental, and Organizational and Management. The outcome was graded using a simple descriptive scale. Data were analysed using Pearson's Chi-Square test for association and univariable and multivariable logistic regression analysis.

Results Totally, 3379 anaesthetics were performed during the audit period. Of these, 174 incident reports were analysed, 163 of which impacted safe veterinary care and 26 incidents were considered to have had major or catastrophic outcomes. Incident outcome was believed to have been limited by anaesthetist intervention in 104 (63.8%) cases. Various factors were identified as: Individual in 123 (70.7%), Team in 108 (62.1%), Organizational and Management in 94 (54.0%), Task and Technology in 80 (46.0%), Work Environmental in 53 (30.5%) and Animal and Owner in 36 (20.7%) incidents.

Individual factors were rarely seen in isolation. Significant associations were identified between Experience and Supervision, $X^2(1, n = 174) = 54177, p = 0.001$, Failure to follow a standard operating procedure and Task Management, $X^2(2, n = 174) = 11318, p = 0.001$, and Staffing and Poor Scheduling, $X^2(1, n = 174) = 36742, p = 0.001$. Animal Condition [odds ratio (OR) = 16210, 95% confidence interval (CI) = 5573–47147] and anaesthetist Decision Making (OR = 3437, 95% CI = 1184–9974) were risk factors for catastrophic and major outcomes.

Conclusions and clinical relevance Individual factors contribute to many safety incidents but tend to occur concurrently with other factors. Anaesthetist intervention limits the consequences of incidents for most animals.

Keywords anaesthesia, human factors, incidents, patient safety, systems analysis.

Introduction

Patient safety and quality improvement are rapidly evolving disciplines in human medicine, involved in the reduction of harm caused to patients directly by the healthcare they are receiving. Voluntary reporting and analysis of safety incidents are considered as key elements of these disciplines (Vincent 2004; Leistikow et al. 2016). Incident reports can be viewed as a “window on the system” in which they arise, providing valuable insights into gaps and inadequacies in healthcare provision (Vincent 2004). Subsequent systems analysis, which aims to identify failures within a healthcare system and an organization as a whole rather than

focussing on individual failures, can highlight both current weaknesses and future problems, facilitating tailored interventions and improvements to healthcare provision (Vincent 2004). To date, this area of study has received little attention in veterinary medicine.

Anaesthesia has always been a specialty at the forefront of patient safety (Gaba 2000). However, little is known about safety in veterinary anaesthesia beyond a number of studies on fatality rates which have disclosed limited numbers of risk factors primarily associated with animal health status, procedure and anaesthetic technique (Clarke & Hall 1990; Johnston et al. 2002; Bidwell et al. 2007; Brodbelt et al. 2008; Bille et al. 2012). To date, the only study to specifically assess safety incidents in veterinary anaesthesia by Hofmeister et al. (2014) documented them using an incident log consisting of a tally of specific incident types that occurred. This gave one of the first insights into the frequency of safety incidents, such as medication and equipment errors.

The objective of this study was to collect, review and analyse short vignettes of safety incidents reported during the management of cases by the anaesthesia service of a university teaching hospital. Using a systems analysis modified for veterinary anaesthesia, we aimed to identify factors and causal themes that contributed to safety incidents.

Materials and methods

Study design

A prospective, descriptive, voluntary reporting audit of safety incidents was performed as part of a self-governance initiative in a multidisciplinary university teaching hospital. Documents were managed in a confidential manner, with only the anaesthesia team aware of the audit being conducted. Information from individual reports was analysed and pooled prior to publication.

Ethics and consent

The study was an audit, as defined by the United Kingdom ethics committees (National Research Ethics Service 2009); therefore, ethical approval was waived by the local ethics and welfare committee. Consent was obtained from all anaesthetists to use the information in the reports and during morbidity and mortality rounds.

Setting and participants

The hospital in which the audit was performed provides both first opinion and referral healthcare services for a range of small animals, equine and farm animals. The anaesthesia service is responsible for approximately 1500–1700 anaesthetics per annum, the majority being in dogs (approximately 1000 cases), followed by cats, horses, farm animals and others (approximately 600, 50, 25 and 10 cases, respectively). Anaesthesia is performed in several discrete locations in the hospital: a small animal surgical unit; small animal endoscopy, dental and electro-diagnostics suite; two small animal radiography suites; a magnetic resonance imaging suite; a computed tomography suite; a radiotherapy unit and a large animal surgical unit. During the period of the audit, anaesthetics were performed by three European College Veterinary Anaesthesia and Analgesia Diplomates, one post-residency clinical anaesthetist, three anaesthesia residents, one registered veterinary nurse and a number of rotating interns. Final year veterinary students were involved with many of the cases, rotating through the anaesthesia service for approximately 80% of the time the audit was conducted.

Data sources and collection

The audit was performed over a period of 23 months between November 2014 and October 2016. The number of anaesthetics performed during this period was determined using electronic hospital records.

Based on the World Health Organization's International Classification for Patient Safety, "Safety Incidents" were defined as any event or circumstance which could have resulted, or did result, in unnecessary harm to an animal or member of staff (Runciman et al. 2009). All the staff members performing anaesthesia were asked to report any such incidents occurring within the peri-anaesthetic period of an animal in a handwritten "Safety Incident Diary" held centrally in the anaesthesia induction suite. Whether to report an incident was left to the individual anaesthetist's discretion, but it was encouraged that any incident, irrespective of severity, be reported. Fatalities and significant anaesthetic related morbidities were also reported. In this study, the peri-anaesthetic period was defined as any time point in which an anaesthetist could be in contact with an animal between pre-anaesthetic assessment and discharge.

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