Factors influencing the postoperative use of analgesics in dogs and cats by Canadian veterinarians

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Abstract

Four hundred and seventeen Canadian veterinarians were surveyed to determine their postoperative use of analgesics in dogs and cats following 6 categories of surgeries, and their opinion toward pain perception and perceived complications associated with the postoperative use of potent opioid analgesics. Three hundred and seventeen (76%) returned the questionnaire. An analgesic user was defined as a veterinarian who administers analgesics to at least 50% of dogs or 50% of cats following abdominal surgery, excluding ovariohysterectomy. The veterinarians responding exhibited a bimodal distribution of analgesic use, with 49.5% being defined as analgesic users. These veterinarians tended to use analgesics in 100% of animals following abdominal surgery. Veterinarians defined as analgesic nonusers rarely used postoperative analgesics following any abdominal surgery. Pain perception was defined as the average of pain rankings (on a scale of 1 to 10) following abdominal surgery, or the value for dogs or cats if the veterinarian worked with only 1 of the 2 species. Maximum concern about the risks associated with the postoperative use of potent opioid agonists was defined as the highest ranking assigned to any of the 7 risks evaluated in either dogs or cats. Logistic regression analysis identified the pain perception score and the maximum concern regarding the use of potent opioid agonists in the postoperative period as the 2 factors that distinguished analgesic users from analgesic nonusers. This model correctly classified 68% of veterinarians as analgesic users or nonusers. Linear regression analysis identified gender and the presence of an animal health technologist in the practice as the 2 factors that influenced pain perception by veterinarians. Linear regression analysis identified working with an animal health technologist, graduation within the past 10 years, and attendance at continuing education as factors that influenced maximum concern about the postoperative use of opioid agonists.

Résumé

Facteurs influençant l'utilisation postopératoire des analgésiques chez le chien et le chat par les vétérinaires canadiens

Quatre cent dix-sept vétérinaires canadiens ont été soumis à une enquête pour déterminer leur utilisation postopératoire des analgésiques chez le chien et le chat à la suite de 6 types de chirurgies et pour connaître leur opinion sur la perception de la douleur et sur les complications associées à l'utilisation postopératoire de puissants analgésiques opioïdes. Trois cent dix-sept (76 %) d'entre eux ont retourné le questionnaire. On définissait comme utilisateur d'analgésiques un vétérinaire qui administrait des analgésiques à au moins 50 % des chiens ou 50 % des chats à la suite de chirurgies abdominales, à l'exclusion des ovariohystérectomies. Les vétérinaires qui ont répondu à l'enquête présentaient une distribution bimodale en ce qui a trait à l'utilisation des analgésiques, 49,5 % étant considérés comme utilisateurs d'analgésiques. Ces vétérinaires tendaient vers une utilisation d'analgésiques chez 100 % des animaux ayant subi une chirurgie abdominale. Les vétérinaires considérés comme non-utilisateurs d'analgésiques en utilisaient rarement suite à quelque chirurgie abdominale. La perception de la douleur était déterminée par une classification des douleurs (sur une échelle de 1 à 10) suite à une chirurgie abdominale et tenait compte de la valeur moyenne obtenue chez les deux espèces ou de la valeur obtenue chez les chiens ou chez les chats pour les vétérinaires n'œuvrant que chez une des deux espèces. Le plus fort niveau de préoccupation concernant les risques associés à l'utilisation postopératoire de puissants agonistes opioïdes était défini comme la plus haute classification obtenue pour chacun des 7 risques évalués à la fois chez le chien et chez le chat. La logistique de l'analyse de régression à identifié le pointage de la perception de la douleur et le niveau de préoccupation maximale concernant l'utilisation de puissants agonistes opioïdes en période postopératoire comme étant des 2 facteurs qui distinguent l'utilisateur d'analgésiques du non-utilisateur. Ce modèle permet de classifier 68 % des vétérinaires en utilisateurs d'analgésiques ou en non-utilisateurs. Une analyse de régression linéaire a identifié le sexe et l'implication d'un technicien en santé animale dans l'exercice de la profession comme les 2 facteurs qui ont influencé la perception de la douleur par les vétérinaires. L'analyse de régression linéaire à identifié l'implication d'un technicien en santé animale, l'obtention de diplôme depuis moins de 10 ans et l'assistance à des sessions de formation continue comme les facteurs qui ont le plus influencé le souci de l'utilisation d'agonistes opioïdes en période postopératoire.

(Traduit par docteur André Blouin)

Can Vet J 1996; 37: 552–556

Introduction

The postoperative use of analgesics in dogs and cats by Canadian veterinarians and their perception of the pain that is felt postoperatively by these species have been reported in a previous paper (1). The factors influencing both the postoperative use of analgesics and

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This work was supported by a grant from the Sir James Dunn Foundation.

Table 1. Percentage of dogs and cats receiving analgesics postoperatively following 6 selected surgical procedures, and the pain scores (mean and standard deviation) assigned by veterinarians following these surgeries

	% Receiving analgesics		Mean pain score[a] (s)[b]	
Surgery	Dogs	Cats	Dogs	Cats
orthopedic	83.9[c]	70.1[c]	8.18 (1.45)[d]	8.03 (1.59)[d]
cruciate	76.2	N/A	7.06 (1.7)	N/A
onychectomy	N/A	47.7	N/A	6.58 (2.01)
abdominal (non-ovariohysterectomy)	38.2	43.9	5.46 (1.55)[d]	5.33 (1.57)[d]
ovariohysterectomy	12.6[c]	16.6[c]	4.20 (1.54)[d]	4.05 (1.63)[d]
castration	10.5	9.3	3.38 (1.40)[d]	2.91 (1.40)[d]
dentistry	32.2	33.8	5.07 (2.05)[d]	4.89 (2.10)[d]

[a]Pain scored on a scale where: 1 = no pain at all in the first 12 h following surgery, 10 = the worst pain imaginable
[b](Standard deviation)
[c]Difference between dogs and cats in % receiving analgesics statistically significant (χ^2 test, $P < 0.05$)
[d]Difference between dogs and cats in mean pain score statistically significant (Wilcoxon signed rank test, $P < 0.05$)

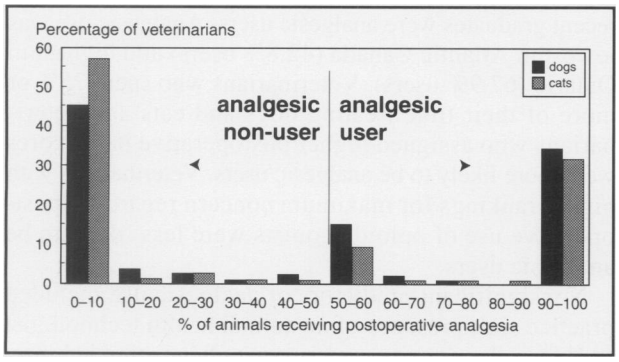

Figure 1. Histogram of analgesic use following abdominal surgery (except ovariohysterectomy) in dogs and cats showing the classification of veterinarians as analgesic users or nonusers.

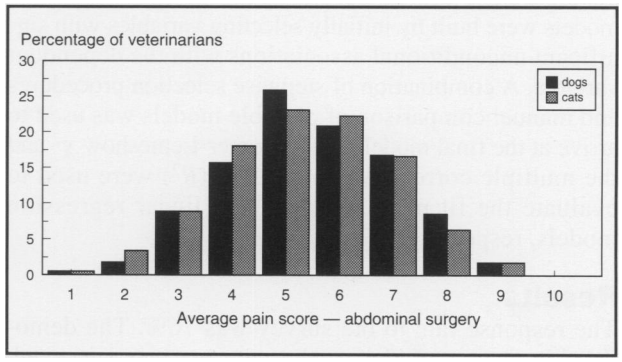

Figure 2. Histogram of pain perception scores assigned by Canadian veterinarians to dogs and cats following abdominal surgery (except ovariohysterectomy).

the perception of postoperative pain are described in this paper.

Materials and methods

The mailed questionnaire that was used to collect the data for this study has been described in a previous paper (1). A copy of the questionnaire is available upon request.

A measurement of analgesic use was required to evaluate which factors distinguish veterinarians who routinely administer analgesics from those who do not. An analgesic user was defined therefore as a veterinarian who administers analgesics to at least 50% of dogs or 50% of cats following abdominal surgery, other than ovariohysterectomy (Figure 1) (1).

A single measurement for pain perception was required to evaluate the influence of the veterinarian's perception of the degree of postoperative pain felt by animals on her or his use of analgesics. Pain perception was defined as the average of the pain rankings for dogs and cats, following abdominal surgery, or the value for dogs or cats if the veterinarian worked with only 1 of the 2 species. Scores for dogs and cats were ranked together, because the frequency distributions for the 2 species were very similar for abdominal surgery (Table 1).

The maximum concern expressed by a veterinarian regarding the risks associated with the postoperative use of potent opioid agonists was the highest value reported for any concern with respect to drug administration to dogs or cats. Risks were assessed on a scale of 1 to 10, where 1 = disagree completely that the risks outweigh the benefits and 10 = agree completely that the risks outweigh the benefits.

All statistical analyses were carried out using Statistix (Analytical Software, Tallahassee, Florida, USA) and associations were considered significant if $P < 0.05$. Simple associations between analgesic use and possible factors that might influence analgesic use were evaluated using ANOVA, chi-square analysis, or the Mann-Whitney test where appropriate. The same analyses were applied to factors likely to influence pain perception.

Table 2. Final multivariable regression models for postoperative analgesic use, maximum concern about the use of potent opioid analgesics, and pain perception scores among Canadian veterinarians

Factor	Coefficient (odds ratio)[a]	Standard error	*P*-value
Logistic regression model of postoperative analgesic use			
pain perception score	0.54 (1.72)	0.12	0.00
maximum concern	−0.16 (0.85)	0.07	0.02
Hosmer Lemeshow $\chi^2 = 11.6$ ($P = 0.17$)			
Linear regression model of maximum concern about use of potent opioid analgesics			
animal health technician employed	−0.75	0.36	0.04
graduated in last 10 y	−0.097	0.33	0.00
continuing education in last 12 mo	0.80	0.37	0.03
$R^2 = 0.09$			
Linear regression model of postoperative pain perception score			
animal health technician employed	0.44	0.21	0.03
gender = female	0.65	0.21	0.00
$R^2 = 0.06$			

[a]Odds ratios calculated based on logistic regression coefficients

Logistic regression was used to identify which factors have the greatest influence on analgesic use, while linear regression was used to determine which factors influence pain perception and maximum concern about postoperative use of opioid agonists. All regression models were built by initially selecting variables with significant unconditional associations with the dependent variable. A combination of stepwise selection procedures and manual comparison of possible models was used to arrive at the final models. The Hosmer-Lemeshow χ^2 and the multiple correlation coefficient (R^2) were used to evaluate the fit of the logistic and linear regression models, respectively.

Results

The response rate to the survey was 76%. The demographic characteristics of the veterinarians surveyed, along with the distributions of analgesic use, drugs used, pain perception scores, and concerns related to potent opioid agonist use have already been presented (1).

There were 49.5% of veterinarians who were defined as analgesic users and 50.5% as analgesic nonusers (Figure 1). In general, veterinarians who were analgesic users in 1 species were also analgesic users in the other species. Of the veterinarians classified as analgesic users and doing surgeries in both dogs and cats, 71% used postoperative analgesia on both species, 25% used it in dogs only, and 4% used it in cats only. Ninety-five percent of veterinarians who were analgesic nonusers in 1 species were analgesic nonusers in both species.

Table 1 contains the percentage of animals receiving analgesics postoperatively following the 6 surgical procedures, and the average ranking assigned by veterinarians to the pain felt by the animals postoperatively. One hundred and sixty-nine out of 247 veterinarians (68.4%) assigned the same pain score to dogs and cats. Those who scored pain differently generally assigned slightly higher scores to dogs (Table 1). The histogram of pain perception by veterinarians following abdominal surgery is contained in Figure 2.

Significant predictors of analgesic use identified by unconditional analyses included gender of the veterinarian, age of the veterinarian, year of graduation, location of the practice in Canada, type of practice, and pain ranking for all surgeries. Analgesic users comprised 58.7% of the women and 39.8% of the men. Significantly more of the younger veterinarians and recent graduates were analgesic users. Analgesic use was lowest in Atlantic Canada (42.8% users) and highest in Ontario (67.9% users). Veterinarians who spent 75% or more of their time treating dogs and cats and veterinarians who assigned higher postoperative pain scores were more likely to be analgesic users. Veterinarians with higher rankings for maximum concern regarding postoperative use of opioid agonists were less likely to be analgesic users.

Nonsignificant predictors of analgesic use included practice size, presence of an animal health technologist (AHT) in the practice, veterinary college attended, participation within the past 12 mo in continuing education that dealt with postoperative pain control, and perceived adequacy of knowledge of issues related to the recognition and control of postoperative pain.

Logistic regression identified pain perception score and maximum concern regarding the use of potent opioid agonists in the postoperative period as the 2 factors that distinguish analgesic users from analgesic nonusers (Table 2). The odds of a veterinarian being an analgesic user increased 1.72 times for each unit increase in his or her pain perception score. On average, analgesic users had a maximum score of 5.5 for concern regarding potent opioid agonists, while analgesic nonusers had a maximum score of 6.9. This model correctly classified 68% of veterinarians as analgesic users or nonusers (66% of users and 70% of nonusers).

Significant predictors of pain perception following initial unconditional analysis included gender of the veterinarian, year of graduation, the presence of an AHT in the practice, type of practice, and participation in continuing education dealing with postoperative pain control within the previous 12 mo. Women and more recent graduates perceived that dogs and cats felt more postoperative pain. Similarly, veterinarians working with an AHT, veterinarians who spent more than 75% of their

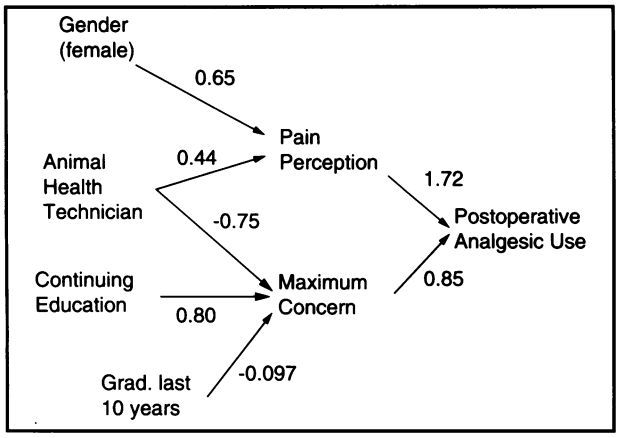

Figure 3. Path diagram showing relationship among factors that influence postoperative analgesic use by Canadian veterinarians. Coefficients on arrows leading to Pain Perception and Maximum Concern are linear regression coefficients while those on arrows leading to Postoperative Analgesic Use are odds ratios.

time treating dogs and cats, and veterinarians who had attended continuing education within the previous 12 mo assigned higher rankings to postoperative pain perception. Nonsignificant predictors included size of practice, veterinary school attended, location of the practice in Canada, and perceived adequacy of knowledge of issues related to the recognition and control of postoperative pain.

Linear regression identified gender and the presence of an AHT in the practice as the 2 factors that influenced pain perception by veterinarians (Table 2). Once these 2 variables were included in the regression model, no other predictor variables were statistically significant. Women and veterinarians who work with AHTs rank pain significantly higher than do men and veterinarians who do not work with AHTs. However, gender and working with an AHT explained only 6% of the variability in pain perception by veterinarians.

The majority of veterinarians (63.2%) had at least one concern regarding the postoperative use of opioid agonists greater than or equal to 5. Linear regression analysis identified that graduation within the past 10 y and working with an AHT both reduced the level of concern, while attending continuing education within the previous 12 mo increased concern (Table 2). However, as with pain perception, the model can explain only a small proportion (R^2 = 9%) of the variation in the maximum concern score.

A path model for factors affecting postoperative use of analgesics, is presented in Figure 3.

Discussion

The information contained in this paper is important for 3 reasons. First, it provides the veterinary profession in Canada with an understanding of some of the factors influencing decision making with regard to the postoperative use of analgesics in small animal practice. Second, it will assist with the design and delivery of relevant curriculum material to undergraduate veterinary students, as well as continuing education to veterinarians in practice. Third, it identifies areas for further research into the area of clinical recognition and treatment of pain in animals.

This survey identified large discrepancies in analgesic use. For each surgical procedure surveyed, veterinarians tended to use analgesics in all patients, or not at all (1). In addition, according to the definition used in this paper, veterinarians were split roughly equally between analgesic users and analgesic nonusers. This maximized the power of the study to detect factors influencing postoperative analgesic use. The 2 main factors influencing this dichotomy in patient management are the veterinarian's perception of the degree of pain felt postoperatively and the maximum concern expressed regarding the risks associated with the use of potent opioid agonists in the postoperative period (Figure 3).

One of the factors influencing attitude toward pain cannot be altered, namely gender. The second factor that increases the ranking of the perception of postoperative pain by veterinarians is the presence of an AHT in a practice. This appears to be a major contribution by AHTs toward improved patient care. Given the realities of veterinary practice, practice management, client consultations, and diagnostic and surgical procedures usually consume most of the veterinarian's time; animal observation, treatment, and assessment in the wards is mainly the responsibility of AHTs. Thus, AHTs are in the best position to assess animals postoperatively, and they appear to be effectively alerting veterinarians to the need for pain management. Future research should perhaps be focussed on factors that influence pain perception among AHTs.

However, these 2 factors account for only 6% of the variability in pain perception among veterinarians. A large part of this variability may be due to the subjectivity of pain evaluation, based upon clinical assessment. Indeed, this subjectivity is one of the major challenges facing the effective clinical evaluation of various analgesic agents and protocols in animals (2).

This survey determined that veterinarians who consider their knowledge of issues related to the recognition and control of postoperative pain to be adequate do not rank pain more highly and are no more likely to be analgesic users than are veterinarians who consider their knowledge to be inadequate. Similarly, participation in continuing education does not appear to have an impact on pain perception. Further work to identify other factors that influence the attitudes of veterinarians toward pain in animals is required. These could be incorporated into the undergraduate curriculum and continuing education programs.

A majority of veterinarians have at least 1 major concern regarding the postoperative use of potent opioid agonists, and this in turn is a major contributor to the reduced use of postoperative analgesics. Unfortunately, objective information regarding risks associated with postoperative administration of these analgesics is presently not available. However, these drugs have been effectively used in the intensive care units of veterinary teaching hospitals on critically ill animals with very few life threatening complications (3). Attendance at continuing education within the past 12 mo is the 1 factor this study identified as raising these concerns and, therefore, reducing analgesic use. This is a regrettable outcome of continuing education in this area. It emphasizes the need for clinical studies that accurately assess the risks, so that unnecessary concerns can be eliminated from the decision making process.

Graduation within the past 10 y and working in a practice with an AHT are the 2 factors that reduce concerns and increase the likelihood that a veterinarian will be an analgesic user. This could be a result of changes in attitudes and practices among faculty in the veterinary schools, which, in turn, influence the practices of graduates. However, in a recent article describing the use of postoperative analgesics in a veterinary teaching hospital between 1983 and 1989, the faculty did not appear to be leading the way to increased analgesic use in the postoperative period, since interns and residents managed postoperative pain more aggressively than did faculty (4). Regardless of the cause, we believe that this is a positive trend within our profession. In addition, working with an AHT is the only factor identified that influences both pain perception and concerns. This emphasizes the role that AHTs play in the improvement of postoperative patient management in Canada. The employment of AHTs and new graduates appears to offer the opportunity to improve postoperative pain management in veterinary practices. CVJ

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CROSS-CANADA DISEASE REPORT

RAPPORT DES MALADIES DIAGNOSTIQUÉES AU CANADA

British Columbia

Papillomatosis of a farmed black cod in British Columbia

A 2 kg, black cod (*Anoplopoma fimbria*) covered with irregularly shaped white skin masses was observed swimming in a 12 m × 15 m seacage containing 2500 fish. The cod was removed at sorting and sacrificed. The ambient water temperature was 7.5°C.

On gross necropsy, there were red, raised, firm, irregularly shaped, single and coalescing masses randomly distributed over the surface of the skin, fins, and eye and inside the branchial and buccal cavities; the masses ranged in size from 2 to 5 mm. With traction, the masses readily detached, leaving dermal ulcers. Representative tissue from all affected organs was fixed in phosphate-buffered formalin.

The histopathology in all tissues was identical. The epidermis was extremely hyperplastic, forming papillary extensions exceeding 50 cells in thickness. Affected epidermal cells exhibited distinct palisading along the basement membrane and did not invade the dermis. There was a general decrease in the proportion of mucous goblet cells. The proliferative epithelium adjacent to the basal cell layer was spongiotic. The basal layer showed a mild to moderate, mixed leucocytic infiltrate, as did the superficial dermis. The gross and and histological findings were consistent with cutaneous papillomatosis.

Cutaneous papillomas are benign tumors that occur on many species of cultured freshwater and marine fish in most parts of the world (1). They are numerous among certain bottom-feeding fishes, such as black cod and eels, and have also been reported in Atlantic salmon (*Salmo salar*) (1). The occurrence of papillomas may be associated with a virus or virus-like particles, in conjunction with a polluted environment (1). Because papillomas of the lip frequently ulcerate, it is speculated that trauma may have a role in promoting their growth (2); another etiology that has been proposed is external parasitism (1).

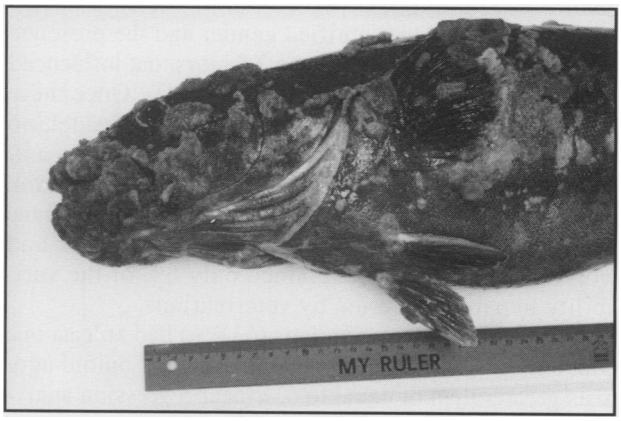

Figure 1. A 2 kg, black cod (*Anoplopoma fimbria*) with cutaneous papillomas.

Acknowledgments

I thank both the Atlantic Veterinary College and the Ontario Veterinary College fish pathology laboratories for their assistance in diagnosing this condition.

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