
Nina L. Mantione, VMD, and Cynthia M. Otto, DVM, PhD, DACVECC

Objective—To characterize the use of antiemetic agents in dogs with canine parvovirus (CPV)-associated enteritis in a veterinary teaching hospital.

Design—Retrospective case series.

Animals—77 dogs with CPV-associated enteritis.

Procedure—Medical records of 560 dogs with confirmed CPV-associated enteritis that were admitted to a veterinary teaching hospital were reviewed. Exclusion criteria included vaccination against CPV infection within the preceding 2 weeks, hospitalization for < 24 hours or removal from the hospital against advice, or an incomplete record. Signalment, diagnostic evaluation, and daily antiemetic administrations were assessed; WBC counts and clinical findings were used to classify dogs as having systemic inflammatory response syndrome (SIRS).

Results—77 dogs were included in the study; 55 (71%) received metoclopramide at least once. Seventy-one dogs survived, and 6 dogs died (all 6 received antiemetics). Compared with dogs that did not receive antiemetics, duration of hospitalization was significantly longer for antiemetic-treated dogs. Daily values of rectal temperature and heart and respiratory rates did not predict administrations were assessed; WBC counts and clinical findings were used to classify dogs as having systemic inflammatory response syndrome (SIRS).

Conclusions and Clinical Relevance—Many dogs with CPV-associated enteritis had persistent vomiting despite antiemetic administration. The apparent difference in duration of hospitalization between antiemetic-treated dogs and other dogs may reflect a difference in disease severity between groups, although antiemetic-associated adverse events (eg, signs of depression, hypotension, and immune modulation) may prolong hospitalization.

In dogs, clinical signs of enteritis caused by canine parvovirus (CPV) include vomiting, profuse bloody diarrhea, dehydration, signs of abdominal pain, fever, and shock. Laboratory findings often include leukopenia and hypoproteinemia as well as electrolyte imbalances secondary to vomiting and diarrhea. Altered gastrointestinal tract motility predisposes affected dogs to ileus and intussusception. Death can result secondary to hypovolemic shock, endotoxemia, and sepsis or as a consequence of systemic inflammatory response syndrome (SIRS).

Criteria for Selection of Cases

Medical records of all dogs for which a diagnosis of CPV infection was made and that were treated for CPV-associated enteritis at the Mathew J. Ryan Veterinary Hospital were reviewed. Exclusion criteria included vaccination against CPV infection within the preceding 2 weeks, hospitalization for < 24 hours or removal from the hospital against advice, or an incomplete record. Signalment, diagnostic evaluation, and daily antiemetic administrations were assessed; WBC counts and clinical findings were used to classify dogs as having systemic inflammatory response syndrome (SIRS).
Hospital of the University of Pennsylvania from May 1997 through April 2000 were reviewed. For inclusion in the study, dogs had to have been admitted to the hospital for treatment of parvoviral enteritis (confirmed by use of a lecal canine parvovirus antigen test). Because of the potential for false-positive test results, dogs that had been vaccinated against CPV infection within 2 weeks prior to admission were not included in this study. Records were also excluded if the dog was hospitalized for < 24 hours or removed from the hospital against the attending clinician’s recommendation or if the medical record was incomplete.

**Procedures**

The age, breed, and sex of each dog were obtained from the medical records; the vaccine history was recorded as 0, 1, 2, or 3 prior vaccines or unknown if the owner did not know or the information was not included in the medical record. Details of antiemetic administration (including type of antiemetic and dosage given) were obtained from each daily treatment record for each dog. The percentage of days in the hospital during which each dog received antiemetic medication was calculated. For example, if a dog was hospitalized for 7 days and an antiemetic was administered to that dog for 3 days during that period, then the percentage of days in the hospital during which the dog received antiemetic medication was 43%.

Data included in the assessment of severity of illness were the daily maximum and minimum heart rate values, respiratory rate values, and rectal temperatures. White blood cell counts were obtained for all days on which such data were available. Adverse events or concurrent problems were identified from the problem list and patient assessment in each record. Medical records of 17 dogs that were enrolled in a clinical trial involving a hospital-specific standardized protocol for diagnosis, monitoring, and treatment of CPV infection in dogs were reviewed specifically for emetic events. In this group of dogs, emetic events had been recorded hourly, allowing calculation of total daily emetic events. In each record, medical records were reviewed specifically for emetic events. In this group of dogs, emetic events had been recorded hourly, allowing calculation of total daily emetic events. Dogs were considered to have SIRS if 2 of the following 3 criteria were met: heart rate > 140 beats/min, respiratory rate > 30 breaths/min, and temperature > 39.2°C (102.5°F) or < 37.8°C (100.0°F). Although there is typically a fourth criterion for SIRS (ie, WBC counts > 19,000 or < 6,000 cells/µL), this criterion was not included because of the limited availability of WBC data. During the first 5 days of hospitalization, the percentage of hospitalized days during which each dog met the SIRS criteria was calculated. For example, if a dog was hospitalized for 3 days but met the SIRS criteria on 2 of those days, that dog met the SIRS criteria during 66% of its hospitalization period. Duration of hospitalization in all cases was defined as the number of days from admission to the recommended time of discharge. Outcome was recorded as survival to discharge from the hospital (ie, survivors) or death or euthanasia prior to discharge from the hospital (ie, nonsurvivors).

**Statistical analysis**—Data analyses were performed by use of computer software. Mean ± SD values are reported for normally distributed data. Normality was determined by visual inspection of the data and by use of the Kolmogorov-Smirnov test. Median values and the interquartile range are reported for nonparametric data. Comparisons between 2 groups were performed by use of the Student t test for parametric data and the Mann-Whitney rank sum test for nonparametric data. Comparisons of multiple groups were performed by use of a 1-way ANOVA or ANOVA on ranks for parametric and nonparametric data, respectively. Post hoc pairwise analysis following ANOVA on ranks was performed with the Dunn test.

**Results**

Five hundred sixty medical records of dogs were identified and reviewed; of these dogs, 77 met the inclusion criteria. In this group, there were 25 (32%) American Pit Bull Terriers, 23 (30%) mixed-breed dogs, 9 (12%) Rottweilers, 5 (6%) German Shepherd Dogs, 3 (4%) Mastiffs, 2 (3%) Akitas, and 1 (1%) of each of the following breeds: Dalmatian, Doberman Pinscher, Golden Retriever, Great Dane, Siberian Husky, Jack Russell Terrier, Labrador Retriever, Miniature Pinscher, Pomeranian, and Presa Canario. The median age was 5 months (25th percentile, 3 months; 75th percentile, 6 months). There were 33 females (1 of which was spayed) and 42 males (2 of which were castrated). From data provided by the dogs’ owners, a series of 3 vaccines against CPV infection had been administered to 11 (14%) dogs, and 1 vaccine had been administered to 9 (12%) dogs; in the remaining 51 (66%) dogs, either no vaccines were administered or the owners did not know whether vaccines had been administered.

**Hospitalization and outcome**—The median number of days of hospitalization for all 77 dogs was 6 days (25th percentile, 3 days; 75th percentile, 8 days). Of the 77 dogs, 71 (92%) survived, 3 (4%) died, and 3 (4%) were euthanatized. Survivors were hospitalized for a median of 7 days (25th percentile, 6 days; 75th percentile, 9 days), whereas nonsurvivors were hospitalized for a median of 3 days (25th percentile, 2 days; 75th percentile, 4 days; P < 0.001).

The duration of hospitalization for dogs treated with antiemetics (median, 7.0 days; 25th percentile, 5.2 days; 75th percentile, 8.8 days) was significantly
pramide, was administered to 53 dogs at least once. The duration of hospitalization for survivors treated with prochlorperazine and metoclopramide concurrently (median, 10 days; 25th percentile, 7 days; 75th percentile, 12 days; n = 10) was significantly longer (P < 0.05) than the duration of hospitalization for survivors treated with metoclopramide alone (median, 7 days; 25th percentile, 6 days; 75th percentile, 8 days; 34) or other antiemetic combinations ([ie, prochlorperazine only, prochlorperazine and metoclopramide on different days, or metoclopramide and ondansetron] median, 7 days; 25th percentile, 7 days; 75th percentile, 8 days; 5). All 22 dogs that did not receive antiemetics survived and were discharged from the hospital. Of the 55 dogs treated with antiemetics, 3 died and 3 were euthanatized.

**Administrations of antiemetic agents**—At some time during hospitalization, antiemetics were administered to 55 (71%) dogs; 22 (29%) dogs received no antiemetic medications. Among the 49 survivors that entered to 55 (71%) dogs; 22 (29%) dogs received no antiemetics. Supplemental nutrition was provided IV to all dogs. Thirty-five of the 77 dogs required IV administration of colloids. Compared with dogs that were not administered antiemetics, dogs receiving antiemetics were more likely (P = 0.048) to be given some form of colloid treatment; however, the frequency of administration of plasma infusions did not differ between these groups. Although ampicillin was administered to all dogs at some time during hospitalization, dogs to which antiemetics were administered were more likely (P = 0.01) to be treated with more than 1 antimicrobial than dogs that did not receive antiemetics. Thirty-two dogs were treated with H2 histaminic receptor blockers; however, the frequency with which such drugs were administered did not differ between dogs that were or were not administered antiemetics. Pain medication was administered to 8 dogs, all of which also received antiemetics. Supplemental nutrition was provided to 3 dogs (2 dogs received liquid diets [administered PO in 1 dog and via feeding tube in another], and 1 dog received total parenteral nutrition). Supplemental nutrition was never initiated before day 5 of hospitalization for any of these dogs. All dogs that received supplemental nutrition were administered antiemetics.

**SIRS**—Initial (day 1) WBC counts were available for 15 of 22 dogs that did not receive antiemetics and 39 of 55 dogs that did receive antiemetics. There was no evidence of a difference in initial WBC counts between those 2 groups; for the dogs that were not administered antiemetics, median initial WBC count was 7,530 cells/µL (25th percentile, 3,330 cells/µL; 75th percentile, 10,180 cells/µL), and for the dogs that were administered antiemetics, median initial WBC count was 4,850 cells/µL (25th percentile, 1,600 cells/µL; 75th percentile, 9,340 cells/µL; P = 0.293). On day 2, dogs that were not administered antiemetics (n = 7) had significantly (P = 0.008) higher WBC counts than dogs that were administered antiemetics (29); in the former group, day 2 median WBC count was 7,520 cells/µL (25th percentile, 7,390 cells/µL; 75th percentile, 8,110 cells/µL), and in the latter group, day 2 median WBC count was 2,320 cells/µL (25th percentile, 880 cells/µL; 75th percentile, 4,100 cells/µL).

Criteria for SIRS were evaluated for each dog on each of the first 5 days of hospitalization. Inclusion of the fourth criterion (ie, WBC counts > 19,000 or < 6,000 cells/µL) in the SIRS determination would have resulted in more dogs fulfilling at least 2 of the criteria. However, because of the inconsistent availability of WBC counts in the medical records, dogs were consid-

![Figure 1](https://example.com/figure1.png)
ered to have SIRS if 2 of the following 3 criteria were met: heart rate > 140 beats/min, respiratory rate > 30 breaths/min, and rectal temperature > 39.2°C (102.5°F) or < 37.8°C (100.0°F); for example, if a dog was hospitalized for 3 days but met the SIRS criteria on 2 of those days, that dog met the SIRS criteria during 66% of the 5 days of hospitalization.

Table 1—Median maximum and minimum rectal temperature, heart rate, and respiratory rate and WBC count recorded daily during the first 5 days of hospitalization in dogs with canine parvovirus–associated enteritis that survived (n = 71) or did not survive (6) to discharge from the hospital.

<table>
<thead>
<tr>
<th>Day of hospitalization</th>
<th>Group</th>
<th>Maximum temperature (°C [°F])</th>
<th>Minimum temperature (°C [°F])</th>
<th>Maximum heart rate (beats/min)</th>
<th>Minimum heart rate (beats/min)</th>
<th>Maximum respiratory rate (breaths/min)</th>
<th>Minimum respiratory rate (breaths/min)</th>
<th>WBC count (cells/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Survivors</td>
<td>39.1 (102.4)</td>
<td>38.3 (101.0)</td>
<td>146</td>
<td>112</td>
<td>36</td>
<td>24</td>
<td>5.27</td>
</tr>
<tr>
<td></td>
<td>Nonsurvivors</td>
<td>40.5 (100.9)</td>
<td>39.3 (102.8)</td>
<td>190</td>
<td>150</td>
<td>34</td>
<td>24</td>
<td>2.65</td>
</tr>
<tr>
<td>2</td>
<td>Survivors</td>
<td>38.8 (101.9)</td>
<td>38.2 (100.8)</td>
<td>132</td>
<td>100</td>
<td>32</td>
<td>22</td>
<td>3.12</td>
</tr>
<tr>
<td></td>
<td>Nonsurvivors</td>
<td>40.0 (104.0)</td>
<td>37.9 (100.3)</td>
<td>186</td>
<td>145</td>
<td>39.5</td>
<td>22</td>
<td>2.65</td>
</tr>
<tr>
<td>3</td>
<td>Survivors</td>
<td>38.9 (101.0)</td>
<td>38.3 (101.0)</td>
<td>120</td>
<td>96</td>
<td>30</td>
<td>20</td>
<td>3.47</td>
</tr>
<tr>
<td></td>
<td>Nonsurvivors</td>
<td>39.5 (103.1)</td>
<td>37.9 (100.2)</td>
<td>157</td>
<td>133</td>
<td>34</td>
<td>26</td>
<td>0.25</td>
</tr>
<tr>
<td>4</td>
<td>Survivors</td>
<td>38.7 (101.6)</td>
<td>38.2 (100.8)</td>
<td>120</td>
<td>100</td>
<td>20</td>
<td>20</td>
<td>4.50</td>
</tr>
<tr>
<td></td>
<td>Nonsurvivors</td>
<td>38.8 (101.8)</td>
<td>36.8 (99.6)</td>
<td>117</td>
<td>134</td>
<td>51</td>
<td>26.5</td>
<td>0.14</td>
</tr>
<tr>
<td>5</td>
<td>Survivors</td>
<td>38.7 (101.6)</td>
<td>38.3 (100.9)</td>
<td>120</td>
<td>96</td>
<td>28</td>
<td>20</td>
<td>4.71</td>
</tr>
<tr>
<td></td>
<td>Nonsurvivors</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA = Not available.

Figure 2—Percentage of the first 5 days of hospitalization during which 71 dogs with CPV-associated enteritis that survived (black bars) and 6 affected dogs that did not survive (white bars) met 2 of the 3 systemic inflammatory response syndrome (SIRS) criteria. Dogs were considered to have SIRS if 2 of the following 3 criteria were met: heart rate > 140 beats/min, respiratory rate > 30 breaths/min, and temperature > 39.2°C (102.5°F) or < 37.8°C (100.0°F); for example, if a dog was hospitalized for 3 days but met the SIRS criteria on 2 of those days, that dog met the SIRS criteria during 66% of the 5 days of hospitalization.

Figure 3—Box-and-whisker plot of the number of emetic events per day in a subset of 17 dogs with CPV-associated enteritis for which emetic events had been recorded hourly during the first days of hospitalization. In each box, the horizontal line indicates the median, the box includes the 25th through 75th percentiles of the data, the error bars indicate the 10th and 90th percentiles, and the symbols are individual outliers.

survivors, the percentage of the first 5 days in the hospital during which dogs met the criteria for SIRS was greater in nonsurvivors than in survivors. Among the survivors, there was no evidence (P = 0.170) of a difference in the percentage of days that met the criteria for SIRS between dogs that received antiemetics and those that did not and there was no evidence of a relationship between duration of hospitalization and percentage of the first 5 days in the hospital during which dogs met the criteria for SIRS.

Detailed information regarding a subset of 17 dogs—Records of 17 dogs for which emetic events were recorded hourly for the first 5 days of hospitalization were identified; 15 of these dogs were administered antiemetics. The frequency of emetic events ranged from 0 to 17 events/d/dog. The median number of emetic events for each day was calculated (Figure 3). During the first 3 days of hospitalization, > 3 episodes of vomiting/d were recorded in 13 dogs, despite antiemetic treatment.

In addition to data regarding temperature, heart rate, and respiratory rate that were recorded daily, daily
WBC counts were also available for these 17 dogs. On the basis of findings of stepwise backward multiple linear regression analysis, the only SIRS parameter that was predictive of emetic events was the maximal heart rate value and this relationship was only evident on day 1 (P = 0.023). The maximum temperature on day 1 was predictive of the duration of hospitalization (P = 0.026). However, when evaluated in the larger group of 77 dogs, the relationship between day 1 maximal temperature and duration of hospitalization failed to be substantiated (P = 0.966) and none of the other 3 variables (maximum heart rate, maximum respiratory rate, and WBC count) were found to be predictive of the duration of hospitalization.

**Adverse effects and concurrent disease**—Among the 77 dogs, concurrent campylobacteriosis was diagnosed in 6 dogs. Two dogs developed pneumonia, 2 dogs developed cellulitis, 1 dog had edema, 1 dog had thrombocytopenia, and 1 dog had a prolonged clotting time. No adverse effects could be directly related to antiemetic treatment in these dogs.

**Discussion**

In dogs, destruction of the intestinal crypt cells, abnormal intestinal motility, and endotoxin-induced activation of the cytokine cascade associated with CPV infection are thought to contribute to both local and central activation of emesis as well as the development of SIRS. The profuse fluid losses as a result of vomiting contribute to rapid dehydration. In addition, aspiration pneumonia and esophageal and gastric mucosal erosions are potential complications of severe and frequent vomiting. Vomiting precludes oral administration of medications and limits nutritional support. Therefore, a major component of the supportive care of dogs with CPV-associated enteritis involves control of emesis.

In the present study, the medical records of 77 dogs hospitalized in a tertiary care center for the treatment of parvoviral enteritis were examined. Consistent with a previous report, most of these dogs were < 6 months of age and either not vaccinated or inadequately vaccinated against CPV infection. The breed distribution among affected dogs in our study was also similar to the breed distribution in a previous study that identified dogs with an increased risk of CPV-associated enteritis.

From the medical records, data were collected to characterize the use of antiemetics in the treatment of the 77 dogs with CPV-associated enteritis. Metoclopramide was the most commonly used antiemetic, followed by prochlorperazine. Ondansetron was administered rarely and only in combination with metoclopramide. Prochlorperazine was frequently administered in combination with metoclopramide to dogs with intractable vomiting.

Metoclopramide antagonizes primarily dopaminergic (D₂) and to a lesser extent 5-hydroxytryptamine (HT₃) serotonergic receptors, thereby preventing stimulation of the chemoreceptor trigger zone. As a 5-HT₄ serotonergic receptor agonist, metoclopramide also has an antiemetic effect by stimulating gastrointestinal motility, because of this property, metoclopramide must be used with caution in dogs that are at risk of intussusception. Another well-recognized adverse effect of metoclopramide is the development of muscle fasciculations and tremors. Recently, data have indicated that, through its action to increase the circulating concentration of prolactin, metoclopramide acts as an immune modulator and increases macrophage production of tumor necrosis factor. In experimental studies of mice with polymicrobial sepsis, administration of prolactin increased the mortality rate among affected mice, whereas administration of metoclopramide increased serum prolactin concentration but did not increase mortality rate. The effect of metoclopramide on serum prolactin concentration and on the inflammatory response in dogs with CPV infection is unknown.

Review of the medical records indicated that the second most commonly used antiemetic in the dogs included in the present study was prochlorperazine, which is a phenothiazine derivative. In addition to α-adrenergic receptor antagonism, the antiemetic properties of prochlorperazine are mediated through antagonism of dopaminergic, histaminergic, and cholinergic receptors; antagonism of these receptors limits stimulation of the chemoreceptor trigger zone. In dogs, prochlorperazine can cause hypotension and sedation; both of these adverse effects may lead to complications in dogs with CPV-associated enteritis, such as shock and increased risk of aspiration of vomitus. Although not reported in dogs to our knowledge, prochlorperazine has been associated with neuroleptic malignant syndrome in humans; this includes development of fever, muscle rigidity, autonomic dysfunction (eg, cardiac arrhythmias and altered blood pressure control), and altered mentation. Similar to the adverse effects associated with metoclopramide, prochlorperazine has been reported to cause muscle fasciculations, tremors, and release of prolactin.

Ondansetron was only used in 1 dog in the present study. This drug is a highly specific antagonist of the 5-HT₃ serotonergic receptors in visceral and vagal afferent neurons; through this action, ondansetron prevents stimulation of the chemoreceptor trigger zone. In children, ondansetron has been shown to be more effective than metoclopramide in control of chemotherapy-induced emesis. In a study in dogs, ondansetron was effective in decreasing the frequency of chemotherapy-induced emesis. Although ondansetron-associated adverse reactions appear to be rare, administration of this drug is often cost prohibitive.

Antiemetics did not completely control vomiting in dogs with CPV-associated enteritis. Dogs that received antiemetics generally required longer hospitalization than dogs that did not receive antiemetics. For 17 dogs (15 of which were administered antiemetics) included in the present study, emetic events had been recorded hourly during the first 5 days of hospitalization; in these dogs, the frequency of vomiting was highly variable (range, 0 to 17 events/d). In a randomized study of dogs with parvoviral enteritis that received enteral nutrition early in the course of treatment, the median incidence of vomiting was 2 to 5
events/12 hours at the time of admission. All dogs in that study were treated with metoclopramide.

A major confounding factor in a retrospective study such as this is the influence of disease severity. In an attempt to determine whether dogs with more severe disease were more likely to receive antiemetics, physiologic variables were evaluated. In the investigation of sepsis in humans, criteria for the systemic inflammatory response include alterations in WBC count, heart rate, respiratory rate, and temperature. Such SIRS criteria have also been proposed for dogs by several authors. However, the specificity of these diagnostic criteria for sepsis in dogs is low, as reported by Hauptman et al. Okano et al. selected much more stringent criteria that limited the sensitivity of the criteria. After initial analysis of the data collected in the present study, the less stringent published SIRS criteria (as suggested by Hauptman et al. or Okano et al.) were applied to all dogs on day 1 and identified 65 of 77 dogs as having SIRS. The inclusion of WBC counts as a criterion did not increase the number of dogs meeting the SIRS criteria. Of the 77 dogs, only 22 dogs met the more stringent SIRS criteria suggested by Okano et al; however, when WBC count was included as a criterion, the number of dogs classified as having SIRS increased to 31. This increase suggests that the incidence of SIRS would be underestimated in dogs when WBC counts are not available. Prior to examining the data collected in the present study, we selected SIRS criteria that were based on our clinical population and that fell between the extremes of the criteria suggested by Hauptman et al. and Okano et al. Application of these criteria was limited by the infrequency of available WBC counts. However, by use of our physiologic criteria, nonsurvivors were significantly more likely to have persistent physiologic derangements and meet SIRS criteria on a greater percentage of the days that they were in the hospital than survivors (median, 100% vs 20%, respectively). The caveat to this finding is that overall, nonsurvivors were only hospitalized for a median of 3 days, and although several survivors had sustained physiologic derangements, those problems eventually resolved. Therefore, fulfillment of SIRS criteria for a sustained period does not appear to be a good predictor of outcome in this population.

The relationship between criteria for SIRS in dogs and duration of hospitalization is inconsistent. In dogs with CPV infection, there was no predictive value associated with fulfillment of the SIRS criteria in relationship to duration of hospitalization. Regardless of whether the criteria suggested by Hauptman et al. or Okano et al. were applied to the data collected in the present study, there was no relationship between fulfillment of the SIRS criteria and duration of antiemetic administration or duration of hospitalization.

In the present study, data were available for a subset of 17 dogs for which hourly monitoring of emesis was performed for some of their hospitalization period and daily WBC counts were recorded; these dogs had been enrolled in a clinical trial in which treatment protocols were standardized, and this may have introduced bias into the findings derived from these dogs. However, the treatment protocols in that study incorporated treatment standards and formalized dosage recommendations that were current at that time, which may have minimized the influences of concurrent treatments (ie, administration of H2 histaminergic receptor blockers, plasma, or synthetic colloids) that could not be controlled for the other dogs in our study. The availability of daily WBC count data allowed for a more detailed evaluation of the criteria for SIRS in this subset of dogs. Intuitively, severity of disease would be expected to correlate with frequency of vomiting, but only maximal heart rate on the first day of hospitalization was predictive of emetic events. Although the model was designed to evaluate predictors of emesis, it is possible that the relationship between emetic events and heart rate was a result of pain and anxiety associated with increased frequency of emetic events rather than severity of hemodynamic compromise leading to increased frequency of emetic events. The small number of dogs for which WBC counts were available and high variance of those counts limited the ability to detect a difference in WBC counts between dogs administered antiemetics and those not administered antiemetics.

In a recent consensus conference on SIRS in humans, recommendations were proposed to expand the criteria for SIRS to include more relevant information, such as predisposition to disease, source of infection, biological response to infection, and evidence of multiple-organ failure. Similar approaches may prove beneficial in veterinary patients. Although there was no consistent relationship between the individual physiologic variables or the SIRS criteria and duration of hospitalization, it is our belief that individual variables at given time points suggested that dogs receiving antiemetics were sicker than dogs that did not receive antiemetics.

Another limitation of our retrospective study is that many dogs received other medical treatments that were not standardized. Although crystalloids and antimicrobial agents were administered to all dogs, dogs receiving antiemetics were more likely to receive multiple antimicrobials, suggesting that these dogs were perhaps more severely affected. In addition, synthetic colloid administration was more likely in the dogs treated with antiemetics than in dogs that were not treated with antiemetics.

Administration of antiemetic drugs is considered a standard of care in dogs with CPV-induced emesis. In the present study, the commonly used antiemetics, metoclopramide and prochlorperazine, did not control vomiting in the dogs with parvoviral enteritis but the retrospective nature of our study and influences of other treatments make evaluation of antiemetic efficacy impossible. The duration of hospitalization was significantly longer for dogs treated with antiemetics, compared with the duration of hospitalization of dogs that did not receive antiemetics. A likely explanation for this finding is that sicker dogs are more likely to require antiemetic use. Alternatively, unrecognized complications of antiemetic administration, such as hypotension, signs of depression, and immune modulation, may contribute to extended periods of hospitalization. Because of these potential adverse effects, care-
ful assessment of dogs with CPV infection for clinical signs of sepsis or SIRS and hypotension should be considered before initiating antiemetic treatment. A prospective randomized trial of antiemetic use in the treatment of dogs with CPV-associated enteritis is warranted to determine the efficacy of such drugs and identify the mechanism by which the duration of hospitalization in antiemetic-treated dogs is prolonged.

References