Nutrition Assessment in a Puppy with Parvovirus

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THE CASE

A 9-week-old intact male French bulldog was presented to an emergency service for vomiting, diarrhea, and hyporexia of 24 hours' duration. The client reported that the puppy, which had been adopted from a pet store 4 days before, had been playful and eating and drinking well before clinical signs developed. The patient received a DA2PP vaccine at 4 and 8 weeks of age.

Physical examination revealed normal heart rate and respiratory rate values and normal pulses; the patient had a body temperature of 104ºF (40ºC), was approximately 7% dehydrated, and weighed 5.3 lb (2.4 kg), with a BCS of 5/9 and normal muscle condition score (3/3).

Dietary History

The client reported that the patient, since weaning, had been consuming ad libitum a commercial dog food formulated to meet the nutrition requirements established by the Association of American Feed Control Officials (AAFCO) Dog Food Nutrient Profiles for all life stages. However, 24 hours before presentation, the puppy would not approach his bowl when offered food and would not drink water. Later, after consuming a small portion of food, he vomited and then developed diarrhea. No treats or table food were offered before presentation; all toys were accounted for, and nothing else was believed to have been ingested.

Diagnostic Results

In-house canine parvovirus ELISA test (IDEXX SNAP Parvo Test; idexx.com) results were positive, and the patient was admitted to the hospital. CBC and serum chemistry profile results revealed leukopenia ($3.83 \times 10^3/\mu L$; range, $5.05\text{-}16.76 \times 10^3/\mu L$) characterized by neutropenia ($2.9 \times 10^3/\mu L$; range, $2.95\text{-}11.64 \times 10^3/\mu L$) with suspected band neutrophils, and hypoglycemia (70 mg/dL; range, 75-116 mg/dL). Electrolyte abnormalities, including hyponatremia (138 mEq/L; range, 142-149.3 mEq/L), hypochloremia (109.5 mEq/L; range, 112.7-118.3 mEq/L), and hypokalemia (3.6 mEq/L; range, 3.62-4.60 mEq/L), were also present. Fecal flotation results were negative.

DIAGNOSIS:

PRESUMPTIVE PARVOVIRUS INFECTION/ PARVOVIRAL ENTERITIS

Treatment & Outcome

Supportive care—including IV fluid support with 2.5% dextrose (16 mL/hr IV), potassium chloride (20 mEq/L), and metoclopramide (0.02 mg/kg/hr IV CRI)—was instituted. Broad-spectrum antibiotics, including ampicillin–sulbactam (20 mg/kg IV q8h) and enrofloxacin (12 mg/kg IV q24h), were administered. Enrofloxacin (extra-label due to patient age) was instituted for broad-spectrum coverage because of presumed sepsis. Additional medications, including maropitant (1 mg/kg IV q24h, extra-label) and dolasetron (0.6 mg/kg IV q24h, extra-label), were added for further control of vomiting.

The patient, since weaning, had been consuming ad libitum a commercial dog food formulated to meet the nutrition requirements established by the AAFCO Dog Food Nutrient Profiles for all life stages.

AAFCO = Association of American Feed Control Officials

On patient admission, the emergency veterinarian recommended nutritional support if the patient was unwilling to eat rather than withholding food until vomiting ceased, as providing early enteral nutrition can potentially improve a patient's outcome and allow for earlier clinical recovery.[1] A nasogastric feeding tube was placed, and the patient's resting energy requirement (RER) and maintenance energy requirement (MER) were calculated (see ***How to Calculate RER & MER in Growing Dogs***). A highly digestible GI therapeutic diet nutritionally adequate for growth based on AAFCO feeding trials was recommended to be offered q6h at 100% RER per day.

The patient consumed 100% of the food offered orally during the first 12 hours of hospitalization (***Table***). The following meal was given 6 hours later, after which the patient again became unwilling to eat and vomiting worsened. A liquid enteral diet formulated to meet the nutritional requirements by AAFCO for adult canine maintenance was initiated at 25% RER per day bolus q6h via nasogastric tube. A liquid enteral diet was preferred for ease of administration through the nasogastric tube. Although this liquid enteral diet was not approved for growth, the crude

HOW TO CALCULATE RER & MER IN GROWING DOGS[7]

- RER = 70 × (body weight kg)$^{0.75}$
  70 × (2.4 kg)$^{0.75}$ = 135 kcal/day
- MER = RER × life stage factor (see ***Suggested Reading***, page 77)
  135 × 3* = 405 kcal/day

*Patient's life stage factor (ie, 3) was determined based on the life stage factor chart presented in *Small Animal Clinical Nutrition*, 5th edition (see ***Suggested Reading***, page 77).

TABLE

NUTRIENT INTAKE DURING HOSPITALIZATION

	Day 1 (12 hours)	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Voluntary intake (1.016 kcal/g)	66 g	None	None	30 g	62 g	100 g	132 g	200 g
Nasogastric feeding (1 kcal/mL)	None	34 mL	68 mL	68 mL	68 mL	34 mL	None	None
Total kcal per day	67 kcal	34 kcal	68 kcal	98 kcal	131 kcal	136 kcal	136 kcal	203 kcal
% RER (135 kcal/day) achieved	50%	25%	50%	73%	97%	100%	100%	150%*
Body weight	5.3 lb (2.4 kg)	5.3 lb (2.4 kg)	4.7 lb (2.1 kg)	5.1 lb (2.3 kg)	5.3 lb (2.4 kg)	5.1 lb (2.3 kg)	5.6 lb (2.5 kg)	5.3 lb (2.4 kg)

*Patient was discharged after 15 hours of hospitalization; feeding amounts calculated to meet MER

protein content (82 g/1000 kcal) exceeded the AAFCO minimum requirement for growth in puppies[2] (56.3 g/1000 kcal) and was therefore deemed superior to alternative nonveterinary options available in the hospital at the time.

Vomiting improved in 24 hours, and feeding was increased to 50% RER per day. Sixty hours after admission, the patient began to eat on his own, and vomiting resolved. Assisted feedings were adjusted until the patient was voluntarily eating 100% RER. Body weight decreased to 4.7 lb (2.1 kg) 48 hours after hospitalization, likely due to fluid losses; however, body weight improved to original admission weight of 5.3 lb (2.4 kg) on day 5 after RER was achieved, as hydration status was maintained (***Table***).

The patient was discharged on day 8 of hospitalization, which was day 5 of eating the GI therapeutic diet fed to meet MER (see ***How to Calculate RER & MER in Growing Dogs***). On the day of discharge, the patient had no vomiting or diarrhea, was normothermic, maintained hydration status, and demonstrated resolution in clinicopathologic abnormalities. The patient was doing well at home at a 5-day recheck. He continued to eat the GI therapeutic diet for 2 weeks postdischarge before transitioning to an over-the-counter commercial puppy food.

Conclusion

A proactive, team-based nutrition approach and client communication at the time of admission ensured the puppy was provided the proper nutritional support. Identifying patients at risk for malnutrition during initial assessment is essential when developing a nutrition plan (see ***Nutritional Support Resources***).

Continues ▶

NUTRITIONAL SUPPORT RESOURCES

Resources to help identify and manage hospitalized patients in need of nutritional support are available on the WSAVA Nutrition Toolkit website (**wsava.org/nutrition-toolkit**)*:

- Feeding Guide for Hospitalized Dogs & Cats: **wsava.org/sites/default/files/hospitalized%20patient%20feeding%20guide.pdf**
- Feeding Instructions: **wsava.org/sites/default/files/Feeding%20chart.pdf**
- New Tools for the Nutritional Assessment & Management of Critical Care Patients: **wsava.org/sites/default/files/wsava%20new%20tools%20jvecc%202015.pdf**

*Global Nutrition Committee Toolkit provided courtesy of the WSAVA

To view a chart to determine a patient's life stage factor, see *Suggested Reading* on page 77.

AAFCO = Association of American Feed Control Officials
MER = maintenance energy requirement
RER = resting energy requirement

ASK YOURSELF …

QUESTION 1

Appropriately written feeding instructions for hospitalized patients should detail:

A. The route of feeding
B. The type of diet and amount to give
C. The frequency of feeding
D. All of the above

MOST ACCURATE ANSWER: D

Appropriately written feeding instructions should contain the route of feeding, type of diet, amount given, and frequency of feeding.[3] Before the appropriate amount of food is determined, the patient's RER should be calculated (see ***How to Calculate RER & MER in Growing Dogs***, page 28).

In this patient, the amount of food offered for voluntary intake was measured in grams, as weighing food with a gram scale is more precise than measuring by cup.[4] Accuracy when measuring dry food with a standard 8-oz measuring cup reportedly ranges from an 18% underestimate to an 80% overestimate.[4] Additionally, in the author's clinical experience, weighing the remaining food after consumption helps objectively determine caloric intake. Feeding amounts in grams can be calculated from the kcal/kg available on the food label.

QUESTION 2

What should an initial energy intake goal be for a hospitalized patient?

A. RER
B. Daily energy requirement for growing puppy
C. 25% of RER
D. Daily energy requirement for adult maintenance

MOST ACCURATE ANSWER: A

RER is recommended as the initial energy intake goal for a hospitalized patient.[3] Although the patient in the described case was a growing puppy, the initial goal remained RER based on his body weight on admission.

Once the patient was voluntarily and consistently consuming 100% RER and clinical signs resolved, his energy intake was increased to meet his MER. In patients weighing less than 6.7 lb (<3 kg), the exponential equation (ie, $70 \times [\text{body weight kg}]^{0.75}$) is recommended to calculate RER.[3] The linear equation (ie, 70 × 30[body weight kg]) may overestimate energy needs in patients weighing less than 6.7 lb (<3 kg) or more than 55.6 lb (>25 kg).[3]

QUESTION 3

In hospitalized parvovirus patients, early enteral nutrition is associated with:

A. Early resolution of vomiting and diarrhea
B. Quicker return of appetite
C. Weight gain
D. All of the above

MOST ACCURATE ANSWER: D

Early enteral nutrition instituted 12 hours after admission through a nasogastric tube in dogs with parvovirus infection can result in earlier clinical improvement and can potentially improve gut barrier function as compared with enteral nutrition instituted after vomiting has ceased for 12 hours (≈50 hours after admission).[1] Early enteral nutrition in critical patients is typically defined as nutrition provided less than 24 to 48 hours postadmission to patients unable to maintain voluntary intake.[5]

Because this patient was presented with hyporexia and vomiting of 24 hours' duration and anorexia was anticipated to continue for at least 48 hours after admission, a nasogastric feeding tube was recommended. Although the patient ate within the first 12 hours of hospitalization, clinical signs worsened and he became anorexic for 48 hours. Because a feeding tube was already in place, enteral feeding could be continued throughout his hospitalization.

MER = maintenance energy requirement
RER = resting energy requirement

QUESTION 4

To avoid negative energy balance in hospitalized dogs and to attain shorter hospitalization periods, the veterinary team must ensure:

A. Veterinary nutrition orders are legible
B. The patient is not held nil per os
C. The patient is held nil per os
D. A & B

MOST ACCURATE ANSWER: D

Because the patient did not want to eat, he was nutritionally supported via nasogastric tube until his appetite returned, which helped achieve a positive energy balance. A study reported that negative energy balance was common in a population of hospitalized dogs.[6] Of the 601 days of negative energy balance in dogs, 22% of the days of negative energy balance were due to poorly written feeding instructions, 34% of the days included instructions to have food withheld, and 44% of the days resulted from the dogs refusing to eat any or all offered food.[6]

QUESTION 5

Which nutrition orders should be reviewed by the team during hospitalization?

A. Caloric goal
B. Route of nutrient delivery
C. Patient body weight
D. All the above

MOST ACCURATE ANSWER: D

Patient assessment and monitoring are critical components of the overall nutrition plan.[3] This patient's nutritional status, based on the orders written, was evaluated consistently by the veterinary team. The feeding orders and route of delivery were reviewed to determine if the caloric goal was met. Ultimately, the patient was not meeting the established caloric goal; therefore, the route of delivery was changed to a nasogastric tube.

All patients should be evaluated consistently to delineate tolerance of past feeding orders and to address the changing status of the disease condition. Findings may lead to new feeding orders. A chart may aid in monitoring important nutritional aspects of hospitalized patients (see ***Nutritional Support Resources***, page 29).

See page 77 for references.

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Suggested Reading

Debraekeleer J, Gross KL, Zicker S. Feeding growing puppies: postweaning to adulthood. In: Hand MS, Thatcher CD, Remillard RL, Roudebush P, Novotny B, eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka KS: Mark Morris Institute; 2010:311-319.