Canine parvovirus (CPV) is a family of viruses that attacks rapidly dividing cells including the lymphoid tissue, bone marrow and GI tract causing vomiting, hemorrhagic diarrhea, and leukopenia. CPV infection is acquired by the fecal-oral route. The virus generally infects dogs less than 1 year of age. The diagnosis is made based on clinical signs, signalment of the patient and poor vaccination history. There are currently 2 active variants of the virus CPV-2b and CPV-2c - of which 2c is the most recent recognized and thought by some to be the most virulent. Confirmation of canine parvovirus infection is achieved using in-hospital ELISA SNAP test and detects CPV-2b and CPV-2c variants of the virus. The test requires a small sample of stool from the patient. There is some debate if these tests show false positive results due to recent vaccine but a recent study found that these tests did not produce positive results following a modified live parvo vaccine, suggesting when positive they have parvovirus. False negatives can occur possibly secondary to antigen dilution from diarrhea.

Clinical findings
Patients suspected of being infected with parvovirus are commonly between 6 weeks to 3 months of any breed that are under-vaccinated. The Doberman and Rotweiller appear to be more seriously affected with the disease. Clinical signs include vomiting, hyperthermia or hypothermia, tachycardia, altered pulse quality, tachypnea, evidence of dehydration and or abdominal discomfort. Early in the disease vomiting may be the only clinical sign but is shortly followed by hemorrhagic diarrhea.

Typical laboratory abnormalities include leukopenia and neutropenia, hypoalbuminemia (from GI losses), hemoconcentration early and anemia later, hypokalemia, and hypoglycemia. Due to decreased perfusion from dehydration, metabolic acidosis and increased serum lactate concentrations are evident on a blood gas analysis.

With aggressive therapy a majority of patients survive the disease however some do die likely secondary to septicemia, hypovolemia and or coagulopathy. It is therefore important to provide aggressive therapy in these patients to improve their outcome.

Therapy
The typical therapy for the CPV patient will include intravenous fluids, electrolyte and glucose replacement, antibiotics, antiemetics, and analgesics. Other therapies may include antacid or GI protectant therapy. Anti-diarrheals are generally not given.

Intravenous fluid therapy of crystalloid fluids is the primary therapy. Fluids such as Plasma-Lyte™, Normosol-R, or Ringer’s solution are commonly administered. Fluids should replace dehydration, provide maintenance requirements and to replace ongoing losses from vomiting and or diarrhea. With replacement crystalloid fluids, only 20–25% of the infused volume of fluid remains within the intravascular space 1 hour after infusion. Therefore, large volumes of replacement crystalloids need to be administered initially to replace intravascular volume and are continued to replace the ongoing losses from the vomitus and diarrhea.

Colloids are high molecular weight compounds that do not readily leave the intravascular space and exert their effect of expanding intravascular volume by holding and potentially drawing water into the vasculature. Common colloidal solutions used in parvovirus patients include plasma and synthetic compounds such as hydroxyethylstarch (Hetastarch™). There is recent blackbox warnings of Hetastarch causing renal damage in humans and is now being avoided by many veterinarians. The veterinary VetStarch™, is a tetrasphate and may not cause renal damage but this is unknown at this time. Fresh frozen plasma transfusion is occasionally administered to CPV infected patients and has colloidal effects, provides albumin, immunoglobulins, and coagulation factors.

Intravenous fluids are frequently supplemented with dextrose and/or electrolytes based on individual cases. Hypoglycemia is common in young puppies. Concentrations of 2.5–5.0% are common. Hypokalemia is the most common electrolyte abnormality and daily monitoring of the patient's serum potassium is required. Potassium can be added to the crystalloid fluid but potassium should not exceed a rate of 0.5 mEq/kg/hr. We routinely administer 20 mEq KCl/liter of fluids as a starting point.

Because of the immune-compromised nature of these patients and the damage to their GI tract septicemia and bacteremia is common. Consequently antibiotics are routinely prescribed to prevent and help combat infection. In mildly affected patients, single-agent antibiotics are often prescribed. We usually give ampicillin + sulbactam. Enrofloxacin in combination with ampicillin is also used in severe cases but has been shown that enrofloxacin has the potential to damage developing cartilage in growing puppies.

Second or third-generation cephalosporins can also be used in some cases.

Antiemetics are indicated to stop vomiting and prevent nausea. Antiemetics will lower the risk of aspiration pneumonia in these debilitated patients and may improve a more rapid return to nutrition. Metoclopramide, dolasetron, ondansetron, and maropitant have all been used to control vomiting in CPV infected patients. Each of these antiemetics has a different mechanism of action and combinations of these medications can be used. Our antiemetic of choice is maropitant (Cerenia). We have shown it is well tolerated,
Parvovirus cases had less nausea and had greater nutrition intake during therapy. We have also shown maropitant has effects on blocking visceral pain as well. Additional pain management may include buprenorphine, morphine, hydromorphone, as examples. Reflux esophagitis is a common finding in patients that have protracted vomiting. The use of gastric cytoprotective medications such as famotidine or pantoprazole are often used.

Parvovirus-infected patients often are not able to tolerate enteral nutrition due to the vomiting, abdominal discomfort, and gastrointestinal pathology. However with aggressive therapy and antiemetics one can begin early nutrition. It has been shown that early nutrition will decrease hospitalization time and improve recovery. Nasoesophageal tube placement and Clinicare™ administration to provide 25% of caloric needs is used. Alternatively we will sometimes just syringe feed a recovery diet such as Hills a/d. Lack of nutrients in the GI tract causes villous atrophy and increased mucosal permeability with bacterial translocation.

Other therapies
Some veterinarians recommend oseltamivir (Tamaflu) is a neuraminidase inhibitor originally developed for treatment of human influenza virus or the administration of hyperimmune serum. There is yet evidence of the benefit and further investigation regarding the efficacy of these therapies is needed before they may be recommended.

Nursing care
Appropriate nursing care and monitoring of these patients is essential as they can rapidly decompensate in a matter of a few hours. We monitor twice daily body weight and pain scores in each patient. PCV, TS, K and WBC are our usual monitoring methods. We monitor body temperature and pain scores qid. Keeping the patients clean, hydrated and comfortable will improve outcome.

Can parvovirus be treated as an outpatient?
Often because of economical reasons it is not possible to treat parvovirus cases in the hospital. In a research study we performed to determine if we could be successful in managing cases on a semi-outpatient basis and found it to be successful in many. In a randomized clinical study parvo dogs were treated in the hospital or in a outpatient type situation. These outpatient dogs however were treated in a hospital environment so we could critically evaluate the animal. In general our outpatient protocol involved 2 hours of rapid IV fluid replacement followed by daily SQ fluid administration, daily maropitant, once only Convenia™ injection and force feeding of Hills a/d. In this study the survival rate was similar. Go to the website for more information http://csu-cvmbs.colostate.edu/documents/parvo-outpatient-protocol-faq-companion-animal-studies.pdf. Although many dogs were successfully managed we would recommend hospitalization and monitoring in the moderate to severe cases.