Developed by: ANNA Specialty Practice Networks

Pediatric Peritoneal Dialysis

Renal Failure (End-Stage Kidney Disease)

Our kidneys are remarkable organs that maintain a constant balance between acid/base, electrolytes and minerals, blood pressure, fluids, red blood cell (RBC) production, and bone growth. Chronic kidney disease (CKD) is an abnormality of kidney structure or function for more than three months. CKD is further classified into five stages based on estimated glomerular filtration rate (eGFR), with stage 1 indicating normal GFR and stage 5 progressing to kidney failure, requiring dialysis (end-stage kidney disease [ESKD]). ESKD may occur in children because of many system disorders or congenital malformations. The cause of ESKD varies by age and race. Symptoms of kidney failure include:

- Anemia.
- Nutritional imbalances.
- Mineral bone disorder.
- Cardiovascular mortality.
- Reduced neurocognitive function.

Treatment Options

Treatment of children with ESKD can be complicated and involves close monitoring by the nephrology team, medication administration, renal-specific diet, and family support, and those in kidney failure may require dialysis/transplantation teams. Kidney transplantation should be the goal in managing these children.

Currently, there are four treatment options for patients with ESKD: in-center hemodialysis, home hemodialysis, peritoneal dialysis, and transplantation. The decision not to treat is a fifth option in patients with terminal, complex medical conditions.

Peritoneal Dialysis

Peritoneal dialysis (PD) is the most common treatment option for children younger than 5 years of age. PD is considered a desirable therapy for children because it allows for regular school attendance and extracurricular activities. PD is performed daily; therefore, diet and fluid intake may be less restrictive. However, PD in the home requires significant commitment from parents/caregivers. They must demonstrate the ability to safely and accurately perform dialysis and catheter care, and call their dialysis center or nephrologist. Parents/caregivers must be able to perform PD daily and attend monthly clinic visits with their child. The home environment must allow for storage of large amounts of dialysis solutions, equipment, and supplies.

PD Advantages

- Preserves residual kidney function.
- Fewer dietary and fluid restrictions.
- Less disruption to the patient's daily activities (Chua & Warady, 2017).

PD Disadvantages

- Burden on the caregiver to perform dialysis at home.
- Time away from work or other responsibilities to learn how to perform PD and attend monthly clinic appointments.
- Life-threatening infection risk if aseptic technique is not followed.

How It Works

Peritoneal dialysis requires surgical placement of a catheter into the patient's peritoneal cavity. The catheter is tunneled under the child's skin to prevent infection. There are one to two cuffs on the catheter. The cuffs help prevent infection and keep the catheter secured. The PD catheter extends from the patient's abdomen and is connected to dialysis tubing and solution.

A warmed, sterile electrolyte solution, called dialysate, is instilled into the abdomen and allowed to dwell for a prescribed time. The peritoneal membrane lines the peritoneal cavity and functions like a filter when the dialysate is placed into the peritoneal cavity. The dialysate remains in the peritoneal cavity for a prescribed period of time, then it is drained from the peritoneal cavity and replaced with fresh dialysate. This cycle is repeated several times within a prescribed time. The process of instilling dialysate, dwelling the dialysate in the peritoneal cavity, and draining the dialysate is called a cycle or exchange. Several cycles occur overnight or during the day, depending on the type of PD prescribed.

Waste products usually cleared by the kidneys are instead removed in the dialysate solution. Waste products or solutes, such as urea, move across the peritoneal membrane into the dialysate. This process of solute removal from a high concentration of solutes in the blood to low concentration of solutes in the dialysate solution is called diffusion. Osmosis occurs when excess water from the patient crosses over the peritoneal membrane into the dialysate solution in response to the hypertonic glucose concentration in the dialysate.

Training

The patient (when age-appropriate) and/or the patient's parents/caregivers are trained by an experienced nurse to perform peritoneal dialysis. The training includes instructions on how to set up the PD machine, determine dialysis solutions, monitor for signs and symptoms of infection, and properly clean the PD catheter exit site. Typically, training occurs in the PD unit in the outpatient setting, but training may also occur while the child is hospitalized. A home visit is recommended as part of the training.

Peritoneal Dialysis Solutions

Peritoneal dialysis solutions are manufactured in several different glucose concentrations to help control the amount of fluid removed from the patient. The higher the glucose concentration, the more fluid is removed.

Types of Peritoneal Dialysis

There are two types of PD: continuous ambulatory peritoneal dialysis (CAPD) and continuous cycling peritoneal dialysis (CCPD).

CAPD

Continuous ambulatory peritoneal dialysis requires fresh dialysate to be instilled manually into the peritoneal cavity via the PD catheter. The dialysate dwells for 3 to 5 hours, then it is drained from the peritoneal cavity. CAPD does not require a machine, but it does require the catheter to be opened frequently to allow for several exchanges a day. There is a greater risk of infection with CAPD than with PD modalities that utilize machines.

CCPD

Continuous cycling peritoneal dialysis is the most common type of PD used in children. CCPD, or automated peritoneal dialysis (APD), requires the patient to be connected to a machine (cycler), which controls the exchange of the dialysate fluid over a period of 8 to 12 hours. This may be easier for the family/caregivers because the child receives dialysis in the comfort of their home while asleep. The timing of starting and stopping dialysis can be tailored to match the child and family's schedule.

Care of the PD Catheter

Catheter care consists of careful assessment and observation, and meticulous sterile dressing changes until the catheter exit site is fully healed, typically four to six weeks after insertion of the catheter (Warady et. al, 2024). After it is healed, the catheter exit site should be cleansed with a sterile cleansing solution every two to three days, and after water exposure, vigorous exercise, or soiling of the dressing (Warady et.al, 2024). More frequent changes may be necessary if the patient wears diapers or has a gastrostomy tube, colostomy, vesicostomy, or any other drain or condition that would be a potential source of contamination to the PD catheter site. In these cases, continued use of dressings at the PD catheter exit site is recommended. The catheter should also be stabilized securely to the abdomen to avoid any trauma or injury to the exit site. Any redness, streaking along the tunnel, drainage, bleeding, pain when touched, or leaking of dialysis fluid should be reported to the PD nurse and nephrologist immediately.

The catheter should remain closed when not in use. Most PD catheters have a piece of tubing (called an extension set or transfer set) attached. The transfer set is a small segment of tubing with a clamping device placed on the end of the catheter in a sterile environment. All catheters have a sterile cap placed on the end to keep the catheter closed in a sterile manner. If the extension set becomes detached or the sterile cap comes off unintentionally, the PD nurse and nephrologist should be notified immediately. If the catheter end is exposed or contaminated, there is a risk of peritonitis, a potentially life-threatening infection of the peritoneal cavity. Symptoms of peritonitis include fever, abdominal pain, vomiting, diarrhea, or cloudy dialysate drainage. The PD nurse and nephrologist should be notified immediately if any of these symptoms occur.

Volume and Blood Pressure Control

Patients on PD may have high or low blood pressure. Fluid status may play a role in blood pressure. Parents/caregivers should monitor both weight and blood pressure at home. Weight greater than the patient's estimated dry weight (EDW) after dialysis may mean the patient is fluid-

overloaded (hypervolemia), and this could contribute to high blood pressure. Edema and headaches may be symptoms of volume-related hypertension. It is possible to have high blood pressure in the absence of fluid overload.

In contrast to too much fluid, patients on PD can also experience symptoms caused by too little fluid (hypovolemia). Patients who are hypovolemic may experience symptoms of dizziness and low blood pressure. Patients may become hypovolemic if too much fluid is removed during dialysis. In this case, their weight after dialysis would be below their EDW. Hypovolemia can be the result of vomiting, diarrhea, or excessive sweating during summer months. Symptoms, as well as blood pressure and weight measurements out of the patient's desired range, should be reported to the nephrologist. Because children should gain weight with normal growth, home blood pressure and weight data, as well as physical examination, should be utilized to evaluate EDW frequently. Weights greater than the EDW after dialysis with normal or low blood pressures and no noticeable edema may indicate actual weight gain associated with a child's normal growth.

Medications

Patients on dialysis must comply with fluid restrictions, dietary restrictions, and a medication regimen in addition to their dialysis treatments to maintain optimal patient outcomes. These can be exceptionally challenging to the pediatric patient. Fluid restrictions are based on the size of the child and the amount of residual urine the child still produces. The diet restricts sodium, potassium, and phosphorus – found in most food children often like to eat. There are medications that must be taken at certain times of the day. Some of the common medications are:

- Calcium carbonate (TUMS®), sevelamer (Renagel®, Renvela®), calcium acetate (Phoslo®) – Phosphorus binders taken with meals and snacks to decrease bone loss.
- Calcitriol (Rocatrol®) – Vitamin D analog that helps manage low calcium levels and treat bone disease,
- Epoetin alfa (Epogen®), epoetin alfa-epbx (Retacrit®), darbepoetin alfa (Aranesp®) – Promote RBC production. Injections are usually given once or twice per week. Darbepoetin alfa is long-acting and usually given every other week or monthly.
- Ferrous sulfate – Iron supplements; treat iron deficiency, anemia.
- Multivitamins – Used as supplement for vitamins lost during dialysis treatments.
- Human growth hormone (HGH) – Long-term treatment for growth failure, daily injection.
- Antihypertensives – Treat high blood pressure.
- Docusate sodium (Colace®), polyethylene glycol (MiraLAX®) – Stool softeners to relieve constipation associated with PD.

What Is the Goal?

The goal for children on PD is optimal patient outcomes to remain as healthy as possible to qualify for a kidney transplant. Patient care is very individualized and based on the child's health status, physical age, emotional age, parental/caregiver support, and resources, as well as many other factors. Not all children qualify for a kidney transplant; therefore, the goal is to maintain optimal health and successfully transition into the adult dialysis environment.

References

Chua, A.N., & Warady, B.A. (2017). Care of the pediatric patient on chronic dialysis. *Advances in Chronic Kidney Disease, 24*(6), 388-397. https://doi.org/10.1053/j.ackd.2017.09.008

Warady, B.A., Same, R., Borzych-Duzalka, D., Neu, A.M., El Mikati, I., Mustafa, R.A., Begin, B., Nourse, P., Bakkaloglu, S.A., Chadha, V., Cano, F., Yap, H.K., Shen, Q., Newland, J., Verrina, E., Wirtz, A.L., Smith, V., & Schaefer, F. (2024). Clinical practice guideline for the prevention and management of peritoneal dialysis associated infections in children: 2024 update. *Peritoneal Dialysis International, 44*(5), 303-364. https://doi.org/10.1177/08968608241274096

Additional Readings

Counts, C.S. (Eds). (2020). *Core curriculum for nephrology nurses* (7th ed.). American Nephrology Nurses' Association.

Szeto, C.-C., Li, P.K.-T., Johnson, D.W., Bernardini, J., Dong, J., Figueiredo, A.E., Ito, Y., Kazancioglu, R., Moraes, T., Van Esch, S., & Brown, E.A. (2017). ISPD catheter-related infection recommendations: 2017 update. *Peritoneal Dialysis International*, *37*(2), 141-154. https://doi.org/10.3747/pdi.2016.00120

ANNA Mission Statement

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