Pediatric ESRD Hemodialysis Fact Sheet

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American Nephrology Nurses' Association

Developed by:
ANNA Pediatric Nephrology Specialty Practice Network

ANNA's Mission Statement

ANNA promotes excellence in and appreciation of nephrology nursing so we can make a positive difference for people with kidney disease.

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END STAGE RENAL DISEASE: WHAT IS IT?

Chronic kidney disease (CKD) or **end stage renal disease (ESRD)** may occur in children as a result of many systemic disorders or congenital malformations. The most common of these disorders or malformations are polycystic kidney disease, obstructive uropathy, hypoplastic or dysplastic kidneys, reflux nephropathy, and focal segmental glomerulosclerosis. Children with CKD may experience fatigue, sluggishness, decreased urine output, anemia, bone disease, and hypertension. Treatment can be complicated and involves the use of medication, special diet, and dialysis or transplantation. Renal transplantation should be the goal in managing these children.

TREATMENT OPTIONS: WHAT ARE THEY?

Unfortunately, the incidence of CKD in children has steadily increased over the past twenty years. Fortunately, treatment options have increased or have become more effective. Treatment options are incenter hemodialysis, home hemodialysis, peritoneal dialysis, and transplantation.

HEMODIALYSIS: WHAT IS IT?

Hemodialysis is a treatment that cleans the blood of excess waste products and removes excess fluid. Blood is removed from the child, passed through an artificial kidney or dialyzer. Excess water and waste are removed through a semipermeable membrane by diffusion and osmosis. The child must have blood vessel access by which the blood can be removed and returned. There are three types of vascular access for hemodialysis: arteriovenous fistula (AVF), arteriovenous graft (AVG), and central venous catheter (CVC).

An arteriovenous fistula is created when an artery is surgically connected to a vein, most commonly in an arm. The strong flow of the arterial blood through the vein increases the size of the vein and thickens the vein wall. Large needles can be placed and provide the blood flow needed for hemodialysis. This is the preferred hemodialysis access as it does not introduce foreign objects into the

child and has fewer complications.

If a child does not have adequate blood vessels to create a successful AVF, an arteriovenous graft may be placed. A graft is synthetic material used to attach the artery to the vein which then provides an area of increased blood flow. Large needles are also placed into grafts to provide the blood flow for hemodialysis.

CARE OF THE AVF AVG:

- Protect access arm as much as possible.
- No blood pressure (BP) or blood draws in access arm.
- No tight jewelry on access arm.
- Patency is assessed by auscultation with a stethoscope for presence of bruit and palpation for presence of a thrill.
- The chronic renal center must be notified immediately in the absence of bruit or thrill, or if the child presents with symptoms of infection.

A CVC is a double lumen catheter that is tunneled under the skin and leads directly to the heart. On occasion, a "temporary" catheter may be placed in event that a patient starts dialysis emergently in an acute setting. Patients usually do not leave the hospital with a temporary catheter. A "permanent" catheter can be used for a longer period of time, but should not be considered a permanent access. These tunneled, cuffed catheters are typically used when an arteriovenous fistula or graft is maturing or healing. The preferred location for a catheter is in the internal jugular vein although the catheter exit site is typically on the upper chest.

CARE OF THE CVC

- Keep the dressing clean and dry.
- Apply new dressing when necessary, at a minimum weekly, using sterile tech nique.
- Report signs of infection immediately.
- Report any bleeding at catheter exit site.
- Apply direct pressure and transport patient to ER if catheter becomes dislodged. Apply pressure to the insertion site of a cuffed catheter rather than the exit site. The insertion site is above the exit site and usually has a small scar.

EQUIPMENT

- Keep the dressing clean and dry.
- Infants may need the hemodialysis tubing and dialyzer to be primed with blood and/or albumin to prevent cardiovascular collapse when the circuit volume, or extracorporeal volume, is removed from their body.
- To calculate a safe extracorporeal volume: determine patient's weight in kilograms (kg)

  80 mls./kg= estimated blood volume (EBV) in mls.
  10 % of EBV is a safe extracorporeal volume
  0.1 x EBV in mls.=safe extracorporeal volume in mls.

  Example: Patient weight = 6 kg
  80 x 6=480 mls 0.1 x 480mls = 48 mls

Total volume of hemodialysis circuit should be no more than 48 mls, or should be primed with blood.

Different institutions use different mixtures of blood products for priming. Whole blood, 50% PRBC's/50% albumin mixture and 50% PRBC's/50% NSS are some examples . If a circuit is primed with blood, the blood does not get returned to the patient at the end of the treatment.

MEDICATION

Dialysis patients must comply with a fluid restriction, dietary restrictions, and a medication regimen in addition to their dialysis treatments in order 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 urine the child still produces daily. The diet restricts sodium, potassium, and phosphorus, which are in most things a child likes to eat. There are medications that must be taken at certain times of the day and medications that are given at dialysis. Some of the common ones are:

- Calcium carbonate/Phoslo, Renvela, Fosrenol: These are phosphate binders, when taken with meals may decrease the rate of bone loss that is common in dialysis patients.

- Calcijex/Rocaltrol: The vitamin D analog for the management of hypocalcemia.
- Erythropoeitin/Epogen/Aranesp: These medications promote red blood cell production, decreasing or eliminating the need for blood transfusions. These medications may be given subcutaneously or intravenously.
- Venofer (Iron Sucrose), Infed (Iron Dextran), Ferrous sulfate: Iron supplementation for the treatment of iron deficiency anemia.
- Renal vitamin.
- Human Growth Hormone: Long term treatment for failure to grow.
- Paracalcitriol (Zemplar): Used for the prevention and treatment of secondary hyperparathyroidism associated with renal failure.

Children must depend on their parents or guardians to assist them in maintaining compliance with diet and medication regimens.

CHALLENGES FOR CHILDREN ON HEMODIALYSIS: WHAT ARE THEY?

Because children should gain weight with normal growth, blood pressure and weight data as well as physical exam should be utilized to evaluate estimated dry weight frequently. Difficulty tolerating fluid removal during treatment, weights greater than estimated dry weight (EDW) after dialysis with normal or low blood pressures and no appreciable edema likely indicates actual weight gain associated with growth.

One of the major challenges for children on hemodialysis is dietary and fluid restrictions. For infants, it is a challenge for the parents. For the school age child, social issues become a factor. Other children don't understand why this child cannot have french fries and a Coke with them. Peer pressure may make compliance much more difficult.

Children on hemodialysis must dialyze anywhere from three days per week to six days per week. This does interfere with time in school. School age children tend to miss several hours of school in a week. Dialysis centers try to supplement their learning with tutors and actual school teachers.

Children who grow up with renal failure may very well look physically different than other children their age. They may be small in stature, their skin may have a different hue, and they may have a very obvious graft or fistula in one of their extremities. Children with catheters cannot swim. Children with grafts or fistulas, as well as

catheters are encouraged not to participate in contact sports. These factors can be socially and emotionally challenging.

CHILDREN ON HEMODIALYSIS: WHAT IS THE GOAL?

The goal for children on hemodialysis is optimal patient outcomes in order to remain as healthy as possible in preparation for an eventual kidney transplant. Patient care is very individualized based on the child's health status, physical age and emotional age, parental or guardian support and resources, as well as many other factors. Not all children will qualify for a kidney transplant, therefore their goal would be to maintain optimal health and to successfully transition into the adult dialysis environment.

_____is a student at your school and is being treated with hemodialysis at _____ . His/her primary cause of renal failure was _____.

Other Questions:
For questions and/or concerns please contact us at 1-888-600-2662

For more information about nephrology nursing, dialysis, transplantation, or other renal disorders, check out the American Nephrology Nurses' Association (ANNA) Web site at annanurse.org.

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