Dialysis Fellowship

Curriculum Details

The following topics will be covered during the course of the dialysis fellowship and are intended to add educational content above and beyond what is routinely covered during a general nephrology fellowship. The dialysis fellow is expected to gain competence in these areas and be able to teach what he/she has learned to others by the end of the fellowship.

- **Alarms and dialysis safety equipment**: The dialysis fellow should understand the various safety considerations and monitors built into the dialysis machine, how they function and their limitations. In addition the dialysis fellow will come to understand how to develop a culture of safety in the dialysis unit.

- **Alternate methods for assessment of dialysis adequacy**: The dialysis fellow is expected to master the understanding of urea kinetics but also move beyond urea based methods of dialysis adequacy to understand concepts such as the middle molecule hypothesis, the hemodialysis product, blood volume processed, equivalent renal clearance, dialysate-based measures of adequacy and currently utilized real-time machine based methods of adequacy assessment.

- **Blood circuit design**: The dialysis fellow is expected to understand the design of the blood circuit including the blood pump, tubing designs and needle designs. This includes appreciation for the materials utilized in the blood circuit, how they are sterilized, and complications that can arise related to the blood circuit components.

- **CMS conditions for coverage of a dialysis provider**: The dialysis fellow is expected to become familiar with the conditions for coverage of a dialysis provider with particular emphasis on the conditions that pertain to the responsibilities of the medical director and monitoring of quality. The dialysis fellow is also expected to gain an understanding of the dialysis unit survey process and gain appreciation of the available materials which provide interpretive guidance for CMS surveyors.

- **Dialysate components**: The dialysis fellow should become very familiar with the chemistry of available dialysate products and how each of the components is relevant to patient care. The dialysis fellow will understand the different formulations of commercially available dialysate, how the kidney center prepares dialysate and safety concerns / importance of monitoring of dialysate production in center.

- **Dialysate proportioning**: The dialysis fellow will gain a greater appreciation for the “guts” of the dialysis machine. This includes a historical background on the development of different proportioning systems. The dialysis fellow will gain recognition of the various components involved in the dialysate circuit, how the machine proportions concentrate with water, how the machine monitors dialysate to ensure safe production and the limitations and advantages of the available methods of proportioning.

- **Dialysis in clinically complicated situations**: The dialysis fellow should have experience with and an understanding of the unique clinical situations that demand an alternate approach to standard dialysis in order to protect patients. Examples of scenarios covered include patients on LVAD or ECMO,
patients with advanced liver disease, patients with CNS injury or increased ICP, pregnant patients and dialysis in patients with advanced dementia, behavioral or psychological problems.

- **Dialysis machine failures**: The dialysis fellow will become familiar with the methods for monitoring and calibration of dialysis machines. Safety mechanisms inherent in dialysis technology will be reviewed. Case examples of situations in which dialysis machine failures have led to patient morbidity will be reviewed. Understanding of the limitations of current dialysis technology can lead to greater ability to ensure patient safety.

- **Dialyzer design**: The dialysis fellow will understand historical considerations in the design of dialyzers and how the technology of dialyzers has advanced over the past several decades. Details such as dialyzer material, Kuf, KoA, how to interpret dialyzer specification sheets, methods of dialyzer sterilization and common reactions to dialyzer materials will be reviewed.

- **End of life planning and palliative care for dialysis patients**: The dialysis fellow will become familiar with the role of dialysis in palliation of the end stage renal condition. How to modify the dialysis prescription to optimize comfort and quality of life during end of life transitions will be reviewed. It is expected that the dialysis fellow will also gain understanding and experience in developing advance care directives with patients. The medical management or palliation of symptoms bothersome to the dialysis patient will also be reviewed.

- **ESRD Network structure**: The dialysis fellow will gain an understanding for the national system of ESRD networks, their contracts with CMS and their role in assuring quality of ESRD care. Dialysis fellows will have the opportunity to participate in center based network quality projects.

- **Home hemodialysis with NxStage machine**: The provision of home dialysis using the NxStage machine demands a different understanding than traditional dialysis. Topics covered will be a review of the NxStage equipment, water efficient dialysis techniques, flow fraction, dialysate production with the pure flow system, how to write a prescription for NxStage dialysis and how to assess dialysis adequacy in home dialysis or frequent dialysis patients.

- **Infection control issues in the dialysis unit**: The dialysis fellow will gain an understanding of issues central to the prevention of infection in the dialysis center. Topics covered will be methods utilized to prevent access infection, management of access related infections, prevention of hepatitis B and hepatitis C in dialysis patients, prevention of C. difficile infections and tuberculosis in dialysis patients, vaccination and monitoring of immunity in dialysis patients.

- **Management of infectious complications of PD**: The dialysis fellow will develop expertise in the management of infectious complications of peritoneal dialysis. Topics covered will include management of peritonitis, atypical peritonitis, exit site and catheter related infections among others.

- **Management of non-infectious complications of PD**: The dialysis fellow will understand how to manage various complications that can occur related to peritoneal dialysis catheter function; management of complications such as hernias, hydrothorax, dysfunctional catheter, omental wrap, adhesions, membrane failure and encapsulating sclerosis among other complications will be reviewed.

- **Modified Albumin Dialysis**: The dialysis fellow will learn about alternate forms of extracorporeal support such as albumin dialysis utilized at UW for the treatment of end stage liver disease. Alternate and novel methods of blood purification and liver support will also be reviewed.

- **Monitoring of water treatment systems**: The dialysis fellow will actively participate in and appreciate the methods of monitoring a water treatment system at an outpatient dialysis unit. The dialysis fellow will become familiar with all regulations regarding water monitoring and purification. Common scenarios where water systems have failed will be reviewed. The dialysis fellow will gain experience in troubleshooting water treatment system problems. Dialysis fellows will have access to facility systems specialists and water engineers to learn from.
• **On-line hemodiafiltration in center:** The dialysis fellow will have the opportunity to learn about how to perform hemodiafiltration with on-line generation of ultrapure replacement fluid in center. Special considerations related to on-line generation of infusion fluid and water purity will be covered.

• **Peritoneal dialysate:** The dialysis fellow will become familiar with the chemical composition of commercially available peritoneal dialysis solutions. Variations on the standard dialysate solutions such as low glucose degradation solutions, amino acid solutions, bicarbonate based solutions and how they differ from standard solutions will be covered.

• **Peritoneal dialysis cycler technology:** The dialysis fellow will become familiar with the various cycler technologies available. How to operate dialysis cyclers, how to troubleshoot cycler problems and how to monitor cycler function will be covered.

• **Peritoneal membrane characteristics:** The dialysis fellow will become familiar with the structure and function of the peritoneal membrane, how peritoneal membrane function is assessed and how to modify the peritoneal prescription based on peritoneal membrane function.

• **Placement of peritoneal dialysis catheters:** The dialysis fellow will become familiar with the various methods of peritoneal dialysis catheter placement and the strengths and limitations of each method.

• **QAPI process and monitoring quality in the dialysis unit:** The dialysis fellow will learn about the QAPI process at dialysis units and be intimately involved in the assessment of quality in the dialysis unit including monitoring of quality and development of action plans to address potential problems in the dialysis unit.

• **Sorbent dialysis:** The dialysis fellow will become familiar with sorbent technology and how it has been used in various extracorporeal therapies. Basics about how sorbent technologies work will be covered.

• **Timing the initiation of dialysis:** The dialysis fellow will gain a greater understanding about how best to transition patients with advanced CKD to dialysis. Considerations regarding access planning, maximal medical management without dialytic therapy and optimal timing for the start of dialysis will be covered in detail.

• **Ultrafiltration control:** The dialysis fellow will gain an understanding of the way in which dialysis machines remove fluid from the blood circuit. Monitoring and calibration of ultrafiltration systems will be covered. Ultrafiltration coefficients, ultrafiltration rates, transmembrane pressure and how they relate to fluid removed during dialysis will be covered. The dialysis fellow will become a master in understanding how fluid removal during dialysis affects the dialysis patient, appropriate UF goals, and achieving adequate fluid balance in dialysis patients.

• **Water purification methods:** The dialysis fellow will gain an advanced understanding of the components involved in a water purification system and the function of each component. Routine monitoring and troubleshooting of water treatment systems will be appreciated.

• **Water sources, components:** The dialysis fellow will understand various sources of water available from municipal authorities and how source water content dictates the necessary components in a water treatment system. The dialysis fellow will be involved in the regular analysis of source and product water at the dialysis unit. AAMI guidelines/standards and how they relate to the conditions for coverage will be covered.