

## OUTPATIENT HEMODIALYSIS EXPERIENCE

Each second year fellow is assigned at least four hemodialysis patients for longitudinal care. As described in the general curriculum, fellows round a minimum of every other week on hemodialysis patients during this rotation in one of two off campus hemodialysis units administered by the Renal Research Institute located nearby the University campus in Ann Arbor or in Livonia, Michigan.

### **Educational Goals:**

The fellow is expected to develop competency in providing compassionate and thorough care to a medically and socially diverse group of outpatients with end stage renal disease. The major goal of this rotation is to provide fellows with the education and experience to become proficient in managing outpatient hemodialysis patients.

### **Objectives:**

#### **Patient Care**

Each fellow will rate as valuable the importance of being a nephrologist to a medically and socially diverse group of patients

Each fellow will be able to obtain and document a history and physical, formulate an assessment and plan, and communicate this assessment when necessary to other physicians.

#### ***Specific educational goals are to provide clinical expertise and opportunities to gain experience in:***

- Longitudinal care of hemodialysis and peritoneal dialysis patients including writing dialysis prescriptions, and assessment of dialysis adequacy;
- Understanding the principles and practice of peritoneal dialysis, including cyclers, and peritoneal equilibration tests;
- Understanding the prevention and treatment of complications in hemodialysis and peritoneal dialysis patients;
- Understanding principles of hemodialysis water treatment;
- Understanding reuse of artificial hemodialysis membranes and principles of biocompatibility.

#### ***The fellow is also encouraged to acquire the knowledge base (that includes cost effectiveness) and expertise in:***

- Bone biopsy;
- Placement of peritoneal dialysis catheters;
- Balloon angioplasty of vascular access;
- Peritoneal Biopsy.

#### **Medical Knowledge**

The fellow will demonstrate a knowledge and understanding of the pathophysiology, diagnostic evaluation, and therapeutic management of a core group of issues in end stage renal disease patients described above.

By the end of the year, each fellow will have attended and participated in the educational activities listed in the teaching methods section.

By the end of the year of outpatient dialysis ambulatory experience, each fellow is encouraged to complete some of the recommended readings (below)

### **Communication Skills**

Each fellow will demonstrate effective communication skills with the attending physician by discussing each clinic visit or rounds. A dictated medical note will also demonstrate effective communication skills.

Each fellow will discuss the ongoing care of each patient with the appropriate attending at the time of the clinic visit or rounds and if follow up discussion is required

Each fellow will model effective interpersonal communication skills with patients, families, and other allied health professionals

### **Professionalism**

Each fellow will demonstrate compassion and understanding to a group of socially, economically and racially diverse group of patients

Each fellow will rate as comfortable his/her ability to assume the leadership role for outpatient care

### **Practice-Based Learning and Improvement**

The fellow will incorporate basic knowledge of evidence-based medicine in evaluation and management of outpatient medical problems

Each fellow will continue the process of acquiring skills and documenting the procedures required by the ABIM, as listed in the procedure summary

Each fellow will model practice based learning and effective information seeking in the outpatient care of patients

### **Systems-Based Practice**

The fellow will demonstrate competence in the integration of inpatient and outpatient care, and a systems approach to care

The resident will demonstrate an awareness of issues cost-effective medicine in patient care, by discussing the cost implications of cases with the attending physician

Each fellow will routinely evaluate the socioeconomic needs of his/her patients, including health insurance, access to care and co-payments necessary to provide care

**Teaching Methods:**

Teaching methods include one-on-one supervision with a Nephrology Supervising Attending. Topics pertinent to this experience may be covered in the July Nuts and Bolts Lecture Series, Core Curriculum Conference, and Clinical Conferences. Literature may be provided by the Nephrology attending. PUB MED, Up-to-Date and other textbooks are available at the Dialysis Units and all public workstations in the hospital.

**Mix of Diseases:**

Patients with all forms of End Stage Renal Disease may be seen in this ambulatory experience including diabetes, hypertension, chronic glomerulonephritis, chronic tubulointerstitial disease, genetic kidney diseases such as Polycystic Kidney disease, HIVAN, SLE as well as other diseases that may result in End Stage Renal Disease.

**Patient Characteristics:**

As above, each second year fellow follows at least four hemodialysis outpatients. Many patients may initiate dialysis over the age of 70, therefore experience in geriatric aspects of Nephrology are obtained.

**Types of Clinical Encounters:**

Patients are encountered in the outpatient ambulatory setting at the dialysis units.

**Procedures:**

Fellows supervise hemodialysis and peritoneal dialysis treatments for the assigned outpatients.

**Services:**

Besides supervising dialysis treatments, fellows will help care of the assigned patient in the outpatient setting which may include phone calls to other physician providers or various aspects of health care. Fellows will interact with support staff including nurses, renal dieticians, renal social workers, and others.

**Reading List:**

1. Afthentopoulos, I.E., et al., Sclerosing peritonitis in continuous ambulatory peritoneal dialysis patients: one center's experience and review of the literature. *Adv Ren Replace Ther*, 1998. 5(3): p. 157-67.
2. Albers, F.J., Clinical considerations in hemodialysis access infection. *Adv Ren Replace Ther*, 1996. 3(3): p. 208-17.
3. Beathard, Physical Examination of the Dialysis Vascular Access. *Seminars in Dialysis*, 1998. 11: p. 231-236.
4. Bergstrom, J., Nutrition and mortality in hemodialysis. *J Am Soc Nephrol*, 1995. 6(5): p. 1329-41.

5. Beto, J.A., et al., Variation in blood sample collection for determination of hemodialysis adequacy. Council on Renal Nutrition National Research Question Collaborative Study Group. *Am J Kidney Dis*, 1998. 31(1): p. 135-41.
6. Blake, P., et al., Recommended clinical practices for maximizing peritoneal dialysis clearances. *Perit Dial Int*, 1996. 16(5): p. 448-56.
7. Block, G.A., et al., Association of serum phosphorus and calcium x phosphate product with mortality risk in chronic hemodialysis patients: a national study. *Am J Kidney Dis*, 1998. 31(4): p. 607-17.
8. Bloembergen, W.E., et al., Relationship of dose of hemodialysis and cause-specific mortality. *Kidney Int*, 1996. 50(2): p. 557-65.
9. Brady, J.P., J.W. Snyder, and J.A. Hasbargen, Vancomycin-resistant enterococcus in end-stage renal disease. *Am J Kidney Dis*, 1998. 32(3): p. 415-8.
10. Brunet, P., et al., Tolerance of haemodialysis: a randomized cross-over trial of 5-h versus 4-h treatment time. *Nephrol Dial Transplant*, 1996. 11(Suppl 8): p. 46-51.
11. Burkart, J.M., et al., Solute clearance approach to adequacy of peritoneal dialysis. *Perit Dial Int*, 1996. 16(5): p. 457-70.
12. CANUSA, Adequacy of dialysis and nutrition in continuous peritoneal dialysis: association with clinical outcomes. Canada-USA (CANUSA) Peritoneal Dialysis Study Group. *J Am Soc Nephrol*, 1996. 7(2): p. 198-207.
13. Cimochoowski, G.E., et al., Superiority of the internal jugular over the subclavian access for temporary dialysis. *Nephron*, 1990. 54(2): p. 154-61.
14. Clark WR, M.B., Kraus MA, Macias WL, Solute Control in Acute Renal Failure: Prescription and Delivery of Adequate Extracorporeal Therapy. *Seminars in Dialysis*, 1996. 9: p. 133-139.
15. Cobb, D.K., et al., A controlled trial of scheduled replacement of central venous and pulmonary-artery catheters. *N Engl J Med*, 1992. 327(15): p. 1062-8.
16. Daugirdas, Nils Alwall Lecture: Urea Kinetic Modeling: Practical Consequences of the Regional Blood Flow Model. Part One. *URR and Kt/V*, . 1997.
17. Davies, S.J., et al., What really happens to people on long-term peritoneal dialysis? *Kidney Int*, 1998. 54(6): p. 2207-17.
18. Dougherty, M.J., et al., Endovascular versus surgical treatment for thrombosed hemodialysis grafts: A prospective, randomized study. *J Vasc Surg*, 1999. 30(6): p. 1016-23.
19. Duszak, R., Jr., et al., Replacement of failing tunneled hemodialysis catheters through pre-existing subcutaneous tunnels: a comparison of catheter function and infection rates for de novo placements and over-the-wire exchanges. *J Vasc Interv Radiol*, 1998. 9(2): p. 321-7.

20. Favre H, M.P., Stoermann C, Anticoagulation in Continuous Extracorporeal Renal Replacement Therapy. *Seminars in Dialysis*, 1996. 9: p. 112-118.
21. Feldman, H.I., S. Kobrin, and A. Wasserstein, Hemodialysis vascular access morbidity. *J Am Soc Nephrol*, 1996. 7(4): p. 523-35.
22. Flanigan MJ, R.M., Frankenfield D, 1998 Core Indicators Study-Anemia in Peritoneal Dialysis: Implications for Future Monitoring. *Seminars in Dialysis*, 1999. 12(3): p. 157-161.
23. Fried, L., et al., Recommendations for the treatment of lipid disorders in patients on peritoneal dialysis. ISPD guidelines/recommendations. *International Society for Peritoneal Dialysis. Perit Dial Int*, 1999. 19(1): p. 7-16.
24. Gokal, R., et al., Peritoneal catheters and exit-site practices toward optimum peritoneal access: 1998 update. (Official report from the International Society for Peritoneal Dialysis). *Perit Dial Int*, 1998. 18(1): p. 11-33.
25. Haage, P., et al., Treatment of hemodialysis-related central venous stenosis or occlusion: results of primary Wallstent placement and follow-up in 50 patients. *Radiology*, 1999. 212(1): p. 175-80.
26. Hakim, R.M., et al., Effect of the dialysis membrane on mortality of chronic hemodialysis patients. *Kidney Int*, 1996. 50(2): p. 566-70.
27. Heimbürger O, A.A., Dietary Requirements in Peritoneal Dialysis. *Seminars in Dialysis*, 1997. 10: p. 87-93.
28. Hull, A.R., The era of standardized prescription management for peritoneal dialysis must end. *Perit Dial Int*, 1996. 16(5): p. 434-6.
29. Klinkmann, H. and J. Vienken, Membranes for dialysis. *Nephrol Dial Transplant*, 1995. 10(Suppl 3): p. 39-45.
30. Kopple, J.D., et al., A proposed glossary for dialysis kinetics. *Am J Kidney Dis*, 1995. 26(6): p. 963-81.
31. Kopple, J.D., McCollum Award Lecture, 1996: protein-energy malnutrition in maintenance dialysis patients. *Am J Clin Nutr*, 1997. 65(5): p. 1544-57.
32. Krediet, R.T., Prevention and treatment of peritoneal dialysis membrane failure. *Adv Ren Replace Ther*, 1998. 5(3): p. 212-7.
33. Lameire N, B.W., Vanholder R, Consequences of Using Glucose in Peritoneal Dialysis Fluid. *Seminars in Dialysis*, 1998. 11(5): p. 271-275.
34. Marx, M.A., et al., Cefazolin as empiric therapy in hemodialysis-related infections: efficacy and blood concentrations. *Am J Kidney Dis*, 1998. 32(3): p. 410-4.
35. Nassar, G.M. and J.C. Ayus, Infectious complications of the hemodialysis access. *Kidney Int*, 2001. 60(1): p. 1-13.

36. Owen, W.F., Jr., et al., The urea reduction ratio and serum albumin concentration as predictors of mortality in patients undergoing hemodialysis. *N Engl J Med*, 1993. 329(14): p. 1001-6.
37. Perini, S., et al., Tesio catheter: radiologically guided placement, mechanical performance, and adequacy of delivered dialysis. *Radiology*, 2000. 215(1): p. 129-37.
38. Schillinger, F., et al., Post catheterization vein stenosis in haemodialysis: comparative angiographic study of 50 subclavian and 50 internal jugular accesses. *Nephrol Dial Transplant*, 1991. 6(10): p. 722-4.
39. Sherman, R.A. and T. Kapoian, Recirculation, urea disequilibrium, and dialysis efficiency: peripheral arteriovenous versus central venovenous vascular access. *Am J Kidney Dis*, 1997. 29(4): p. 479-89.
40. Sigler MH, M.M., Membranes and Devices Used in Continuous Renal Replacement Therapy. *Seminars in Dialysis*, 1996. 9: p. 98-106.
41. Silver, S.M., R.H. Sterns, and M.L. Halperin, Brain swelling after dialysis: old urea or new osmoles? *Am J Kidney Dis*, 1996. 28(1): p. 1-13.
42. Swartz, R.D., C.L. Boyer, and J.M. Messana, Central venous catheters for maintenance hemodialysis: a cautionary approach. *Adv Ren Replace Ther*, 1997. 4(3): p. 275-84.
43. Teehan, B.P., C.R. Schleifer, and J. Brown, Adequacy of continuous ambulatory peritoneal dialysis: morbidity and mortality in chronic peritoneal dialysis. *Am J Kidney Dis*, 1994. 24(6): p. 990-101.
44. Vonesh, E.F., et al., Peritoneal dialysis kinetic modeling: validation in a multicenter clinical study. *Perit Dial Int*, 1996. 16(5): p. 471-81.
45. Weinreich, T., Prevention of renal osteodystrophy in peritoneal dialysis. *Kidney Int*, 1998. 54(6): p. 2226-33.
46. Welage, L.S., et al., Influence of cellulose triacetate hemodialyzers on vancomycin pharmacokinetics. *J Am Soc Nephrol*, 1995. 6(4): p. 1284-90.
47. Zaleski, G.X., et al., Experience with tunneled femoral hemodialysis catheters. *AJR Am J Roentgenol*, 1999. 172(2): p. 493-6.
48. Zibari, G.B., et al., Preoperative vancomycin prophylaxis decreases incidence of postoperative hemodialysis vascular access infections. *Am J Kidney Dis*, 1997. 30(3): p. 343-8.
49. Keane, W.F., et al., Adult peritoneal dialysis-related peritonitis treatment recommendations: 2000 update. *Perit Dial Int*, 2000. 20(4): p. 396 – 411.
50. Teng, M., et al., Survival of patients undergoing hemodialysis with paricalcitol or calcitriol therapy. *N Eng J Med*, 2003. 349(5): p. 446 – 56.
51. Hufnagel, G., et al., The influence of automated peritoneal dialysis on the decrease in residual renal function. *Nephrol Dial Transplant*, 1999. 14: p. 1224 -1228.

52. Correa-Rotter, R. and Cueto-Manzano, A., The problem of the high transporter: Is survival decreased? Proceedings of the ISPD, 2001. 21: S75 – S79.
53. Cueto-Manzano, A.M. and Correa-Rotter, R., Is high peritoneal transport rate an independent risk factor for CAPD mortality? Kidney Int, 2000. 57: p. 314 -320.
54. Scully, R.E., et al., Case Records of the Massachusetts General Hospital, Weekly Clinicopathological exercises, Case 31-2001. N Engl J Med., 2001. 345(15): p. 1119 – 1124.
55. Alpert, M.A., and Ravenscraft, M.D., Pericardial involvement in end-stage renal disease. Am J Med Sci, 2003. 325(4): p. 228 – 36.
56. Locatelli, F., et al., Treatment of anaemia in dialysis patients with unit dosing of darbepoetin afa at a reduced dose frequency relative to recombinant human erythropoietin (rHuEpo). Nephrol Dial Transplant, 2003. 18: p. 362 – 369.
57. Mann, H. and Stiller S., Sodium modeling. Kidney Int, 2000. 58: S79 – S88.
58. Izumotani, T., et al., Correlation between peritoneal mesothelial cell cytology and peritoneal histopathology with respect to prognosis in patients on continuous ambulatory peritoneal dialysis. Nephron, 2001. 89: 43 – 49.
59. Miyata, T., et al., Toward better dialysis compatibility: Advances in the biochemistry and pathophysiology of the peritoneal membranes. Kidney Int, 2002. 61:375 – 386.

**Pathologic material:**

Pathologic material such as arterial graft removal as well as other pathology sent to our renal pathology division will be available for review.

**Evaluations:**

The fellow is evaluated using the ABIM form for Evaluation of Clinical Competence, Categories evaluated include the core competencies of Patient Care, Medical Knowledge, Practice Based Learning , Interpersonal and Communication Skills, Professionalism, Systems Based Learning, evaluation of procedures above, and Moral and Ethical Behavior, and Overall Clinical Competence as a Specialist In Nephrology. A 360 degree evaluation of the core competencies will be administered. These evaluations are filled out every six months by the supervising Nephrology attending. The fellow evaluates the teaching of the Nephrology attending using the form provided.

**Supervision / Lines of Responsibility:**

Fellows round on at least 4 hemodialysis patients with a Nephrology attending and occasionally with a physician's assistant assigned to the patient each week. It is estimated that this rounding will take 2-3 hours per week. The fellow is responsible for interviewing and examining of patients, writing orders, making treatment or medication changes, and dictating notes during these visits. The fellow is responsible for longitudinal follow up including review of laboratory data and radiological assessments. The Nephrology attending reviews the history, physical examination, assessments and plans, and medical notes. The attending discusses any changes of the above with the fellow.