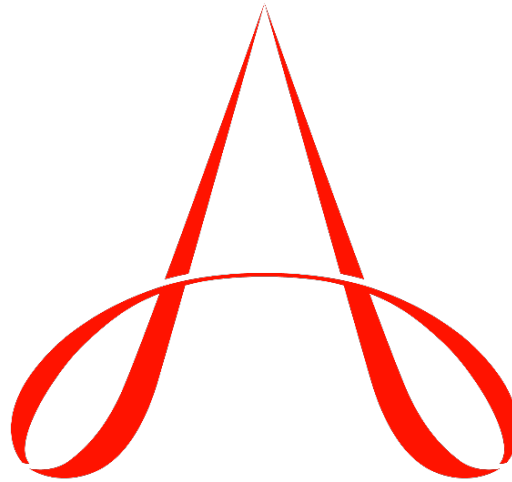




Supplemental Guide: Nephrology



A C G M E

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Milestones Supplemental Guide

This document provides additional guidance and examples for the Nephrology Milestones. This is not designed to indicate any specific requirements for each level, but to provide insight into the thinking of the Milestone Work Group.

Included in this document is the intent of each Milestone and examples of what a Clinical Competency Committee (CCC) might expect to be observed/assessed at each level. Also included are suggested assessment models and tools for each subcompetency, references, and other useful information.

Review this guide with the CCC and faculty members. As the program develops a shared mental model of the Milestones, consider creating an individualized guide (Supplemental Guide Template available) with institution/program-specific examples, assessment tools used by the program, and curricular components.

Additional tools and references, including the Milestones Guidebook, Clinical Competency Committee Guidebook, and Milestones Guidebook for Residents and Fellows, are available on the [Resources](#) page of the Milestones section of the ACGME website.

Patient Care 1: Acute Kidney Injury Overall Intent: To diagnose and treat acute kidney injury	
Milestones	Examples
Level 1 <i>Creates a basic differential diagnosis for patients with acute kidney injury using the history and physical exam</i> <i>Develops a basic diagnostic plan</i> <i>Develops a basic management plan</i>	<ul style="list-style-type: none"> • For an 85-year-old man that presents with nausea, vomiting, hypotension, and worsening kidney function, the differential includes pre-renal, post-renal, and intrinsic acute kidney injury • Orders ultrasound, blood and urine chemistries, and urine sediment • Administers isotonic fluids and recommends chemistries be re-checked
Level 2 <i>Formulates a comprehensive differential diagnosis for patients with acute kidney injury using a focused history and physical exam</i> <i>Recommends diagnostic testing to inform the differential diagnosis</i> <i>Identifies patients who need urgent treatment, including dialysis and medication adjustment</i>	<ul style="list-style-type: none"> • For an 85-year-old man that presents with nausea, vomiting, hypotension, and worsening kidney function, identifies a distended bladder on exam • Orders ultrasound and discovers obstruction; uncovers severe hyperkalemia • Has urinary catheter placed, and orders urgent dialysis when urine output does not increase
Level 3 <i>Formulates a prioritized differential diagnosis for patients with acute kidney injury</i> <i>Interprets diagnostic test results, including evaluation of urine sediment, laboratory and imaging studies, and kidney biopsy</i> <i>Develops and implements a management plan, including dialysis modality selection and/or disease-specific treatment</i>	<ul style="list-style-type: none"> • For a 25-year-old woman with a history of lupus presents with joint pain, rash, and acute kidney infection, takes a history that includes questions about nonsteroidal anti-inflammatory drugs (NSAID) use and immunosuppression adherence, and formulates a differential diagnosis that includes glomerulonephritis, thrombotic microangiopathy, NSAID toxicity, and acute tubular necrosis • Identifies active urine sediment, interprets serologic work-up, and, in consultation with the pathologist, identifies class of lupus nephritis • Prescribes steroids and in consultation with the attending, suggests an immunosuppression regimen
Level 4 <i>Independently formulates a prioritized differential diagnosis for patients with common and uncommon causes of acute kidney injury</i>	<ul style="list-style-type: none"> • For a 63-year-old male undergoing chemotherapy for non-small-cell lung cancer with declining kidney function, hypotension, and severe metabolic acidosis, formulates a differential diagnosis that includes acute tubular necrosis as well as thrombotic microangiopathy and tumor effects (anaerobic metabolism)

<i>Independently interprets and integrates diagnostic test results</i>	<ul style="list-style-type: none"> • Interprets testing in conjunction with the other specialists caring for the patient
<i>Independently develops and implements a management plan with consideration of patient acuity and complexity</i>	<ul style="list-style-type: none"> • Accurately prescribes and manages continuous renal replacement therapy to manage renal failure and acidosis
Level 5 <i>Independently formulates a prioritized differential diagnosis with consideration of rare or newly recognized causes of acute kidney injury</i>	<ul style="list-style-type: none"> • For a 63-year-old man with subacute kidney injury, adenopathy, and pancreatic enzyme elevations, formulates a differential diagnosis that includes acute tubular necrosis, interstitial nephritis, and IgG4-related disease
<i>Identifies indications for ordering advanced diagnostic studies</i>	<ul style="list-style-type: none"> • Performs kidney biopsy demonstrating lymphoplasmacytic infiltration and fibrosis, with IgG4-positive plasma cells
<i>Formulates a management plan incorporating novel therapies</i>	<ul style="list-style-type: none"> • Reviews literature and coordinates care with other subspecialists
Assessment Models or Tools	<ul style="list-style-type: none"> • Case based discussion • Case conferences assessment • Direct observation • In-training examination • Medical record (chart) review
Curriculum Mapping	
Notes or Resources	<ul style="list-style-type: none"> • Kidney Disease Improving Global Outcomes. Clinical practice guideline for acute kidney injury. <i>Kidney International Supplements</i> (2012) 2, 1; doi:10.1038/kisup.2012.1. https://kdigo.org/wp-content/uploads/2016/10/KDIGO-2012-AKI-Guideline-English.pdf Accessed 2019. • National Kidney Foundation, Kidney Disease Outcomes Quality Initiative. Guidelines and commentaries. https://www.kidney.org/professionals/guidelines/guidelines_commentaries Accessed 2019. • Macedo E, Mehta RL. Continuous dialysis therapies: core curriculum 2016. <i>Am J Kidney Dis.</i> 2016 Oct;68(4):645-657. doi: 10.1053/j.ajkd.2016.03.427. Epub 2016 May 28. https://www.ncbi.nlm.nih.gov/pubmed/27241853 Accessed 2019. • Moore PK, Hsu RK, Liu KD. Management of acute kidney injury: core curriculum 2018. <i>Am J Kidney Dis.</i> 2018 Jul;72(1):136-148. doi: 10.1053/j.ajkd.2017.11.021. https://www.ajkd.org/article/S0272-6386(17)31141-1/fulltext Accessed 2019.

Patient Care 2: Chronic Dialysis Therapy Overall Intent: To develop competence in prescribing and managing patients receiving chronic dialysis therapy	
Milestones	Examples
Level 1 <i>Lists the indication(s) for initiation of chronic dialysis</i> <i>Lists common complications in patients on chronic dialysis</i> <i>Identifies types of dialysis access and common access complications</i>	<ul style="list-style-type: none"> • Lists that a 45-year-old man is presenting with nausea, vomiting, weight loss, dysgeusia, lower extremity edema, hyperkalemia, and acidosis • Recognizes that dialysis initiation should be slow and gradual • Has a temporary dialysis catheter inserted, educates patients on dialysis modality and if the patient chooses hemodialysis, and advises placement of an arteriovenous fistula
Level 2 <i>Selects appropriate dialysis modality and writes patient-specific hemodialysis and peritoneal dialysis prescriptions</i> <i>Assesses for common complications of chronic dialysis</i> <i>Performs basic assessment of dialysis accesses</i>	<ul style="list-style-type: none"> • For a 60-year-old woman performing chronic peritoneal dialysis presenting with abdominal pain, writes basic continuous ambulatory peritoneal dialysis prescription • Sends fluid cell count and culture, and discusses empiric and culture-based treatment options • Examines peritoneal dialysis catheter tunnel assessing for exit site (and tunnel) infection
Level 3 <i>Modifies a dialysis prescription based on patient assessment</i> <i>Treats common complications of chronic dialysis</i> <i>Develops a diagnostic and therapeutic plan for management of common access complications</i>	<ul style="list-style-type: none"> • A 50-year-old woman undergoing chronic dialysis via a left upper arm arteriovenous fistula, being administered activated vitamin D for secondary hyperparathyroidism, with worsening hypercalcemia, and high venous pressures • Changes to a non-calcium-based phosphate binder, adjusts dialysis calcium concentration, and adjust activated vitamin D therapy • Has a fistulagram performed to diagnose and optimize access function
Level 4 <i>Independently manages patients receiving dialysis</i> <i>Independently anticipates and manages common and uncommon complications of chronic dialysis</i>	<ul style="list-style-type: none"> • When a 52-year-old woman develops hypotension during chronic dialysis session, reduces ultrafiltration rate, and evaluates for change in cardiac function • Recognizes the urgency of development of cardiac tamponade and requests echocardiogram and cardiology consult

<i>Develops a diagnostic and therapeutic plan for management of uncommon access complications</i>	<ul style="list-style-type: none"> • Recognizes that fistula dysfunction (recirculation) could have led to under-dialysis and orders recirculation studies and fistulagram
<p>Level 5 <i>Identifies the complexities of providing quality care to a population of patients receiving dialysis</i></p> <p><i>Anticipates and manages the breadth of comorbid medical and technical complications in the patient on dialysis, including when dialysis is not appropriate</i></p>	<ul style="list-style-type: none"> • Manages dialysis unit quality improvement measures, medical directorship duties, and responsibilities • For an 87-year-old man on chronic hemodialysis with worsening dementia, counsels family and care team around discontinuing dialysis
Assessment Models or Tools	<ul style="list-style-type: none"> • Case based discussion • Case conferences assessment • Direct observation • In-training examination • Medical record (chart) review • Simulation
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • Kidney Disease Improving Global Outcomes Guidelines. https://kdigo.org/guidelines/ Accessed 2019. • National Kidney Foundation, Kidney Disease Outcomes Quality Initiative. Guidelines and commentaries. https://www.kidney.org/professionals/guidelines/guidelines_commentaries Accessed 2019.

Patient Care 3: Chronic Kidney Disease	
Overall Intent: To evaluate causes, diagnosis, and treatment for a patient with chronic kidney disease	
Milestones	Examples
<p>Level 1 <i>Develops a differential diagnosis of causes of chronic kidney disease</i></p> <p><i>Develops a basic diagnostic plan for patients with chronic kidney disease</i></p> <p><i>Identifies stages of chronic kidney disease and how it relates to patient prognosis</i></p>	<ul style="list-style-type: none"> • Includes diabetic kidney disease and obstruction in the differential for a 75-year-old man with type 2 diabetes mellitus and a serum creatinine of 3.0 mg/dl for at least three months • Orders quantification of proteinuria and fundoscopic exam in a patient with suspected diabetic kidney disease • Identifies correct stage of chronic kidney disease based on estimated glomerular filtration rate and recognizes that progression will vary by degree of albuminuria
<p>Level 2 <i>Expands the differential diagnosis based on specific history/physical information</i></p> <p><i>Modifies the diagnostic plan based on evolving clinical data for patients with chronic kidney disease</i></p> <p><i>Develops a management plan to slow chronic kidney disease progression</i></p>	<ul style="list-style-type: none"> • Obtains history of NSAID use and claudication in a patient with an estimated glomerular filtration rate of 25 ml/min/1.73m², and expands the differential diagnosis to include medication toxicity and atherosclerotic kidney disease • Orders Doppler of renal arteries in a patient with chronic kidney disease and peripheral vascular disease • Discontinues NSAIDs, prescribes a renin-angiotensin aldosterone system inhibitor and a statin
<p>Level 3 <i>Reformulates the differential diagnosis as necessary for atypical disease presentations</i></p> <p><i>Identifies patients with chronic kidney disease who require more evaluation, including kidney biopsy</i></p> <p><i>Develops a management plan for chronic kidney disease complications and discusses treatment options</i></p>	<ul style="list-style-type: none"> • Identifies a more rapid progression of disease than expected for a patient with diabetic kidney disease, and expands differential to include acute glomerulonephritis • Orders a kidney biopsy in a patient with chronic kidney disease and unexplained dysmorphic red cells in the urine • Develops a management plan to treat complications of chronic kidney disease including anemia, metabolic acidosis, and secondary hyperparathyroidism
<p>Level 4 <i>Independently diagnoses common and uncommon causes of chronic kidney disease</i></p> <p><i>Identifies indications for ordering advanced or novel diagnostic studies</i></p>	<ul style="list-style-type: none"> • Suspects a monoclonal gammopathy in a 71-year-old patient with a serum creatinine of 2.4 mg/dl, calcium of 11.1 mg/dl, and a hemoglobin of 8 g/dl • Recognizes anemia out of proportion to stage of chronic kidney disease in the above patient and orders a serum protein electrophoresis with immunofixation

<i>Independently leads the preparation for the next steps in management of progressive chronic kidney disease and integrates patient-specific goals of care</i>	<ul style="list-style-type: none"> • Discusses a comprehensive management plan in an 87-year-old patient with a glomerular filtration rate of 8 ml/min/1.73m² including dialysis options based on the patient's and/or referral to palliative care
Level 5 <i>Independently recognizes rare and newly described causes of chronic kidney disease</i> <i>Identifies candidates for enrollment in research and novel and emerging therapies</i>	<ul style="list-style-type: none"> • Suspects Fabry's disease in a woman with anhidrosis, proteinuria, and neuropathy who presents with increasing dyspnea on exertion • Assists a patient with rare disease in referring to clinical trial participation and/or pursuing genetic testing
Assessment Models or Tools	<ul style="list-style-type: none"> • Case based discussion • Case conferences assessment • Direct observation • In-training examination • Medical record (chart) review
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • Kidney Disease Improving Global Outcomes. CKD evaluation and management. https://kdigo.org/guidelines/ckd-evaluation-and-management/ accessed 2019.

Patient Care 4: Transplant

Overall Intent: To manage care of the transplant patient from pre-transplant assessment, routine monitoring after transplant, complications including rejection and allograft failure

Milestones	Examples
<p>Level 1 <i>Discusses indications and contraindications for kidney transplantation</i></p> <p><i>Identifies the presence of kidney allograft dysfunction</i></p> <p><i>Lists indications for common kidney transplant immunosuppressive medications</i></p>	<ul style="list-style-type: none"> • Identifies a 54-year-old patient with an estimated glomerular filtration rate of 12 ml/min/1.73m² with IgA Nephropathy and no other medical history as an excellent candidate for transplant evaluation • Recognizes the significance of increase in serum creatinine of > 0.3 mg/dl from last prior value in a patient who had a kidney transplant 6 months ago • Lists classes of immunosuppression medications and the importance of drug adherence
<p>Level 2 <i>Identifies and counsels patients and families regarding kidney transplant candidacy and the evaluation process</i></p> <p><i>Generates a differential diagnosis for common causes of kidney allograft dysfunction</i></p> <p><i>Identifies common and uncommon complications of immunosuppressive medications</i></p>	<ul style="list-style-type: none"> • Refers a patient for routine medical care prior to transplant evaluation and educates family members about the possibility of kidney donation • Suspects acute rejection, pyelonephritis, or obstruction in a kidney transplant recipient who presents with an elevation in serum creatinine and tenderness over the allograft • Identifies tremors, headache, hyperkalemia, and microangiopathy as complications of calcineurin inhibitors
<p>Level 3 <i>Manages stable ambulatory post-transplant patients</i></p> <p><i>Generates a differential diagnosis for uncommon causes of kidney allograft dysfunction and an initial management plan for common causes of kidney allograft dysfunction</i></p> <p><i>Manages immunosuppressive medications, including common complications and drug interactions</i></p>	<ul style="list-style-type: none"> • Orders timeline-specific testing in an allograft recipient including chemistries, drug levels, and donor-specific antibodies, and counsels about routine health care maintenance including use of sunscreen • Suspects graft thrombosis or adenovirus infection in a recent kidney transplant recipient with tenderness over the allograft and gross hematuria, and orders an allograft ultrasound, urinalysis and culture, donor specific antibodies, and biopsy when culture is negative • Recognizes gastrointestinal complications of mycophenolate and adjusts dose of the medication

<p>Level 4 <i>Independently manages stable and unstable post-transplant patients</i></p> <p><i>Independently generates a differential diagnosis and management plan for uncommon causes of kidney allograft dysfunction</i></p> <p><i>Independently manages immunosuppressive medications, including patients with allograft dysfunction and failure</i></p>	<ul style="list-style-type: none"> • Creates a robust differential diagnosis for a patient who underwent kidney transplantation 10 years earlier and is now presenting with pancytopenia, hypotension, and elevated serum creatinine • Monitors donor specific antibodies in patients at increased risk of antibody-mediated rejection • Recognizes the differential diagnosis of opportunistic infections, malignancy, and microangiopathy in the above patient, and orders hemolysis labs, infectious work-up, drug levels, and schedules a kidney biopsy • Tapers immunosuppressive medications and transitions to dialysis in a patient with severe fibrosis on allograft biopsy
<p>Level 5 <i>Identifies opportunities to improve kidney transplantation access and outcomes</i></p> <p><i>Identifies novel and emerging therapies for immunosuppression and transplant dysfunction</i></p>	<ul style="list-style-type: none"> • Recognizes the lack of transplant referrals from a chronic kidney disease clinic and creates an educational module to increase referrals • Screens patient's family and friends as potential live donors • Suggests alternate immunosuppression in a patient with post-transplant lymphoproliferative disorder
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> • Case based discussion • Case conferences assessment • Direct observation • In-training examination • Medical record (chart) review • Morbidity and mortality conference presentation assessment
<p>Curriculum Mapping</p>	
<p>Notes or Resources</p>	<ul style="list-style-type: none"> • Kidney Disease: Improving Global Outcomes (KDIGO) Transplant Work Group. KDIGO clinical practice guideline for the care of kidney transplant recipients. <i>Am J Transplant</i>. 2009 Nov;9 Suppl 3:S1-155. doi: 10.1111/j.1600-6143.2009.02834.x. https://www.ncbi.nlm.nih.gov/pubmed/19845597 Accessed 2019.

Patient Care 5: Fluid and Electrolytes	
Overall Intent: To identify, diagnose and manage fluid and electrolyte disorders	
Milestones	Examples
Level 1 <i>Creates a differential diagnosis and initial management plan</i>	<ul style="list-style-type: none"> For a 54-year-old woman presents with hyponatremia to 125 mEq/L, the differential includes syndromes of inappropriate antidiuretic hormone secretion (SIADH) and water intoxication, and recommends checking serum and urine osmolality, and instituting a fluid restriction
Level 2 <i>Develops a comprehensive differential diagnosis, recommends initial diagnostic testing, and identifies patients who require urgent treatment</i>	<ul style="list-style-type: none"> For an 85-year-old man presents with urinary obstruction and potassium of 8 mEq/L, recommends a Foley catheter, electrocardiogram (EKG), IV calcium gluconate, and rapid-acting potassium lowering therapies, and recognizes the urgency of repeat evaluation and considers urgent intermittent hemodialysis
Level 3 <i>Develops a prioritized differential diagnosis, interprets diagnostic test results, and implements a comprehensive management plan</i>	<ul style="list-style-type: none"> For a 46-year-old man with a history of alcoholism presents with altered mental status and a sodium of 106 mEq/L, coordinates a comprehensive work-up and recommends hypertonic saline for symptomatic hyponatremia, including management of overcorrection For a 40-year-old woman who presents with nonproductive cough and hypercalcemia to 14 mg/dL and suppressed parathyroid hormone, orders and interprets a complete work-up of elevated 1,25-vitamin D, elevated angiotensin converting enzyme (ACE) level and chest x-ray with hilar fullness and diagnoses likely sarcoidosis; recommends isotonic crystalloids, loop diuretics, and corticosteroids
Level 4 <i>Independently formulates a differential diagnosis, including common and uncommon causes, and adjusts management plan based on patient response</i>	<ul style="list-style-type: none"> A 21-year-old pregnant woman presents for medical evaluation of hypokalemia and hypomagnesemia. After a comprehensive medication review, considers genetic causes including Gitelman syndrome and follows the patient in clinic and adjust doses of supplements over the ensuing months
Level 5 <i>Independently and effectively manages unusual, rare, or complex fluid and/or electrolyte disorder(s)</i>	<ul style="list-style-type: none"> Recognizes the need to measure fibroblast growth factor 23 (FGF-23) in a 67-year-old woman with hypophosphatemia and heterotopic ossification multiple fractures
Assessment Models or Tools	<ul style="list-style-type: none"> Case-based discussion Case conferences assessment Direct observation In-training examination Medical record (chart) review
Curriculum Mapping	
Notes or Resources	<ul style="list-style-type: none"> Rose BD, Post T. <i>Clinical Physiology of Acid-Base and Electrolyte Disorders (Clinical Physiology of Acid Base & Electrolyte Disorders)</i>. 5th edition. McGraw-Hill Education/Medical; 2001

Patient Care 6: Hypertension	
Overall Intent: To identify, diagnose, and treat hypertensive disorders	
Milestones	Examples
Level 1 <i>Diagnoses and manages hypertension, proposes initial evaluation for secondary causes, and recognizes hypertensive emergencies</i>	<ul style="list-style-type: none"> When a 35-year-old woman is referred for hypertension to 220 mmHg systolic on hydralazine and metoprolol, a suboptimal medical regimen is recognized and considers if the patient has risk factors for secondary hypertension; assesses for evidence of acute end organ dysfunction
Level 2 <i>Develops a differential diagnosis, evaluates causes of secondary and resistant hypertension, and proposes a management plan</i>	<ul style="list-style-type: none"> When a 54-year-old man is referred for hypertension in the setting of hypokalemia and metabolic alkalosis, a potential syndrome of mineralocorticoid excess is recognized and an appropriate workup is initiated; reviews the patient's diet and medications, and ensures that first-line therapies are being used
Level 3 <i>Interprets the results of specialized testing for secondary and resistant hypertension, and adjusts management plan based on treatment results and patient comorbidity</i>	<ul style="list-style-type: none"> In the Level 2 example above, appropriately interprets aldosterone levels and plasma renin activity, and recommends adrenal imaging and initiation of a mineralocorticoid receptor antagonist
Level 4 <i>Independently develops and implements a management plan for secondary and resistant hypertension, and adjusts therapy based on patient acuity and complexity</i>	<ul style="list-style-type: none"> For a 43-year-old woman with a kidney transplant who presents with progressive and poorly controlled hypertension, creates a differential diagnosis that includes tacrolimus toxicity and renal artery stenosis; recommends checking tacrolimus levels and a transplant kidney ultrasound, interprets an imaging study showing transplant renal artery stenosis; and recommends appropriate intervention
Level 5 <i>Independently and effectively manages unusual, rare, or complex presentations of hypertension</i>	<ul style="list-style-type: none"> For a 52-year-old man with hypertension, gout, and progressive chronic kidney disease who presents with worsening hypertension, a thorough social history reveals an occupational exposure to lead and the learner considers lead nephropathy in the differential; orders and interprets appropriate testing and involve experts in the field in the patient's care
Assessment Models or Tools	<ul style="list-style-type: none"> Case-based discussion Case conferences assessment Direct observation In-training examination Medical record (chart) review
Curriculum Mapping	<ul style="list-style-type: none">
Notes or Resources	<ul style="list-style-type: none"> American College of Cardiology. New ACC/AHA high blood pressure guidelines lower definition of hypertension. https://www.acc.org/latest-in-cardiology/articles/2017/11/08/11/47/mon-5pm-bp-guideline-aha-2017/ Accessed 2019.

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|--|---|
| | <ul style="list-style-type: none">● KDIGO. KDIGO Clinical practice guideline for the management of blood pressure in chronic kidney disease. https://kdigo.org/wp-content/uploads/2016/10/KDIGO-2012-Blood-Pressure-Guideline-English.pdf Accessed 2019. |
|--|---|

Patient Care 7: Competence in Procedures Overall Intent: To perform required procedures and manage any related complications	
Milestones	Examples
Level 1 <i>Discusses the indications for and assists with all procedures</i> <i>Discusses potential procedural complications</i>	<ul style="list-style-type: none"> • Identifies need for and assists in the performance of kidney biopsy in a 57-year-old man presenting with microscopic hematuria, nephrotic-range proteinuria, and worsening kidney function • Obtains appropriate informed consent from the patient, discussing risks of bleeding and other complications
Level 2 <i>Performs procedures, with direct supervision</i> <i>Recognizes complications of procedures and enlists help</i>	<ul style="list-style-type: none"> • Performs localization by ultrasound and other key portions of the biopsy procedure under immediate supervision • Requests urgent imaging, hemoglobin level, and frequent vital signs for a patient with post-biopsy pain and hypotension
Level 3 <i>Competently performs procedures, with indirect supervision</i> <i>Manages complications of procedures, with supervision</i>	<ul style="list-style-type: none"> • Properly sets up the sterile field and successfully places a temporary internal jugular hemodialysis catheter • Requests chest x-ray and consults thoracic surgery for a patient who develops acute shortness of breath after hemodialysis catheter placement
Level 4 <i>Proficiently and independently performs procedures</i> <i>Anticipates and independently manages complications of procedures</i>	<ul style="list-style-type: none"> • Serves as the primary operator for localization and performance of kidney biopsy with minimal supervision • Identifies an expanding hematoma immediately after biopsy and recommends additional ultrasonographic evaluation, monitoring, and other imaging as necessary • Identifies and manages anticoagulant and antiplatelet use, severe hypertension, and thin renal cortex as risk factors for biopsy complications
Level 5 <i>Serves as an educational resource for procedures and their complications</i>	<ul style="list-style-type: none"> • Assists other learners in placing temporary hemodialysis catheters
Assessment Models or Tools	<ul style="list-style-type: none"> • Case-based discussion • Case conferences assessment • Checklist review • Direct observation • In-training examination • Medical record (chart) review • Morbidity and mortality conference presentation assessment • Simulation

Curriculum Mapping	•
Notes or Resources	<ul style="list-style-type: none"> • Lucian RL, Moeckel GW. Update of the native kidney biopsy curriculum 2019. <i>Am J Kidney Dis.</i> 73(3):404-415. https://www.ajkd.org/article/S0272-6386(18)31102-8/pdf Accessed 2019. • Hogan JJ, Mocanu M, Berns JS. The native kidney biopsy: update and evidence for best practice. <i>Clin J Am Soc Nephrol.</i> 2016 Feb 5;11(2):354-62. https://www.ncbi.nlm.nih.gov/pubmed/26339068 • Clark EG, Barsuk JH. Temporary hemodialysis catheters: recent advances. <i>Kidney Int.</i> 2014 Nov; 86(5): 888-895. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4220490/ 2020.

Medical Knowledge 1: Physiology and Pathophysiology Overall Intent: To demonstrate advanced knowledge of physiology, pathophysiology, and the basic sciences through integration with diagnosis and management	
Milestones	Examples
Level 1 <i>Identifies key clinical physiological and pathophysiological concepts</i> <i>Identifies key basic science concepts (e.g., histopathology, immunology, genetics, molecular biology)</i>	<ul style="list-style-type: none"> Explains normal kidney handling of sodium and identifies major pathophysiologic changes that occur in patients with ascites and edema Knows nephron segment localization of major transport pathways, such as Na-H exchanger, NaCl cotransporter, NaK2Cl cotransporter
Level 2 <i>Demonstrates knowledge of more complex clinical physiology and pathophysiology</i> <i>Demonstrates knowledge of more complex basic science concepts</i>	<ul style="list-style-type: none"> Explains normal kidney water handling and identifies changes that occur in patients with hyponatremia Explains principal determinants of glomerular filtration and its regulation
Level 3 <i>Applies knowledge of common clinical pathophysiology to diagnosis and management</i> <i>Applies knowledge of basic science concepts of common diseases to diagnosis and management</i>	<ul style="list-style-type: none"> Uses electrolyte-free water clearance to develop a differential diagnosis and treatment plan for a patient with hyponatremia Uses urine testing results to treat a patient with recurrent calcium oxalate nephrolithiasis, hypercalciuria, and hypocitraturia
Level 4 <i>Integrates knowledge of advanced clinical pathophysiology with diagnosis and management</i> <i>Integrates knowledge of advanced basic science concepts of less common diseases with diagnosis and management</i>	<ul style="list-style-type: none"> Describes the pathophysiology of apparent mineralocorticoid excess syndromes and uses this knowledge to order additional diagnostic studies. Distinguishes between proximal and distal renal tubular acidosis, and explains relevant physiology, pathophysiology, and treatment of each
Level 5 <i>Researches newly described and emerging clinical physiology and pathophysiology concepts</i> <i>Researches newly described and emerging basic science concepts</i>	<ul style="list-style-type: none"> Helps to identify and recognize implications of complement system abnormalities in a patient with C3 glomerulopathy Explains the use of genome-wide association study and whole exome sequencing in kidney disease research
Assessment Models or Tools	<ul style="list-style-type: none"> Direct observation In-training exam

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	• Medical record (chart) audit
Curriculum Mapping	
Notes or Resources	<ul style="list-style-type: none">• American Journal of Kidney Diseases. Core curriculum in nephrology. https://www.ajkd.org/content/corecurriculum. Accessed 2019.• Zeidel ML, Hoenig MZ, Palevsky PM. A new CJASN series: renal physiology for the clinician. <i>CJASN</i>. July 2014, 9(7)1271; DOI DOI: https://doi.org/10.2215/CJN.10191012 Accessed 2019.

Medical Knowledge 2: Pharmacology and Therapeutics Overall Intent: To demonstrate knowledge of pharmacology and therapeutics through assessment and management of drug dosing and toxicology	
Milestones	Examples
Level 1 <i>Demonstrates knowledge of pharmacology</i> <i>Recognizes kidney toxicity of common medications and effects of intoxicants</i>	<ul style="list-style-type: none"> • Recognizes the sites of action of the different classes of diuretics • Identifies NSAIDs, intravenous contrast, and aminoglycosides as potentially nephrotoxic
Level 2 <i>Recognizes the effect of kidney disease on pharmacokinetics of medications</i> <i>Employs strategies to minimize drug toxicity in common scenarios</i>	<ul style="list-style-type: none"> • Increases the dose of furosemide and changes from oral to intravenous administration in a patient with acute kidney infection and acute heart failure • Adds chlorthalidone to manage hyperkalemia and resistant hypertension in a patient receiving an ACE inhibitor
Level 3 <i>Monitors and adjusts the choice and dosing of common medications</i> <i>Employs strategies to minimize drug toxicity in complex scenarios</i>	<ul style="list-style-type: none"> • Decreases the dose of cefepime in a critically ill patient who develops acute kidney infection • Prescribes pravastatin instead of simvastatin to a kidney transplant recipient receiving cyclosporine
Level 4 <i>Monitors and adjusts the choice and dosing of uncommon medications</i> <i>Identifies strategies to manage drug toxicities and acute intoxications</i>	<ul style="list-style-type: none"> • Decreases the dose of digoxin in a patient with advanced chronic kidney disease • Prescribes acute hemodialysis in a patient with salicylate intoxication and metabolic acidosis refractory to conservative therapy
Level 5 <i>Demonstrates advanced knowledge of pharmacology of novel therapeutic agents</i>	<ul style="list-style-type: none"> • Prescribes eculizumab for atypical hemolytic-uremic syndrome, and recognizes the need to time administration appropriately with regard to plasma exchange
Assessment Models or Tools	<ul style="list-style-type: none"> • Case-based discussion assessment • Chart-stimulated recall • In-training exam
Curriculum Mapping	•
Notes or Resources	<ul style="list-style-type: none"> • Eyler RF, Shvets K. Clinical pharmacology of antibiotics. <i>CJASN</i>. 14: 1080-1090, 2019. https://cjasn.asnjournals.org/content/14/7/1080. Accessed 2019. • Micromedex: https://www.drugs.com. Accessed 2019

Medical Knowledge 3: Diagnostic Testing in Kidney Disease Overall Intent: To evaluate the risks, benefits, and application of diagnostic testing in kidney disease	
Milestones	Examples
Level 1 <i>Recognizes indications, risks, and benefits for basic diagnostic testing</i>	<ul style="list-style-type: none"> Recognizes the risks and benefits of a kidney biopsy for a 50-year-old woman with nephrotic syndrome and no other past medical history
Level 2 <i>Provides interpretation of basic diagnostic testing results</i>	<ul style="list-style-type: none"> In the same patient, recognizes the limitations of the anti-nuclear antibody profile, and understands how to quantify
Level 3 <i>Recognizes indications, risks, and benefits for advanced diagnostic testing</i>	<ul style="list-style-type: none"> In the same patient, recognizes the value of Anti-PLA2R antibody testing if the diagnosis is membranous glomerulopathy Orders renal vascular imaging if a renal vein thrombosis is suspected
Level 4 <i>Independently interprets advanced diagnostic testing</i>	<ul style="list-style-type: none"> In the same patient, recognizes the significance of the absence of tubuloreticular inclusion bodies in a kidney biopsy
Level 5 <i>Recognizes emerging applications of novel diagnostic testing technologies</i>	<ul style="list-style-type: none"> In the same patient, monitors disease recurrence with serial testing of serum Anti-PLA2R antibody
Assessment Models or Tools	<ul style="list-style-type: none"> Case presentation Direct observation In-training examination Medical record (chart) audit
Curriculum Mapping	
Notes or Resources	<ul style="list-style-type: none"> Fogo A, Alpers CE, Colvin RB et al; <i>Fundamentals of Renal Pathology</i>. 2nd edition. Springer. 2014. Johnson RJ, Feehally J, Floege J, Tonelli M. <i>Comprehensive Clinical Nephrology</i>. 6th edition. 2019.

Systems-Based Practice 1: Patient Safety and Quality Improvement (QI) Overall Intent: To engage in the analysis and management of patient safety events, including relevant communication with patients, families, and health care professionals; to conduct a QI project	
Milestones	Examples
Level 1 <i>Demonstrates knowledge of common patient safety events</i> <i>Understands the importance of reporting patient safety events</i> <i>Demonstrates knowledge of basic quality improvement methodologies and metrics</i>	<ul style="list-style-type: none"> • Lists patient misidentification or medication errors as common patient safety events • Describes how to report errors in their environment • Describes fishbone tool
Level 2 <i>Identifies system factors that lead to patient safety events</i> <i>Demonstrates knowledge of how to report patient safety events through institutional reporting systems (simulated or actual)</i> <i>Describes local quality improvement initiatives</i>	<ul style="list-style-type: none"> • Identifies that management of dialysis catheter dressings may affect infection rates • Asks medical director and nursing about appropriate management options • Summarizes protocols resulting in decreased catheter related infections
Level 3 <i>Participates in analysis of patient safety events (simulated or actual)</i> <i>Participates in disclosure of patient safety events to patients and families (simulated or actual)</i> <i>Participates in local quality improvement initiatives</i>	<ul style="list-style-type: none"> • Performs chart review of patients with chronic hyponatremia who were corrected rapidly • Through simulation, communicates with patients/families about sodium correction error • Participates in project identifying root cause of sodium correction error
Level 4 <i>Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)</i> <i>Empathically discloses patient safety events to patients and families (simulated or actual)</i>	<ul style="list-style-type: none"> • Collaborates with a team to conduct the analysis of hyponatremia treatment errors and can effectively communicate with patients/families about those events

<i>Demonstrates the skills required to implement and analyze a quality improvement project, including in dialysis management</i>	<ul style="list-style-type: none"> • Participates in the completion of a QI project to improve hyponatremia management within the practice, including assessing the problem, articulating a broad goal, developing a SMART (specific, measurable, achievable, relevant, and time-bound) objective plan, and monitoring progress and challenges
<p>Level 5 <i>Actively engages teams and processes to monitor systems to prevent patient safety events</i></p> <p><i>Role models or mentors others in the disclosure of patient safety events</i></p> <p><i>Creates, implements, and assesses quality improvement initiatives at the institutional or community level</i></p>	<ul style="list-style-type: none"> • Assumes a leadership role at the departmental or institutional level for patient safety • Mentors peers in processes and procedures for disclosing hyponatremia overcorrection • Initiates and completes a QI project to improve hospital hyponatremia correction protocols and shares results with stakeholders and broader nephrology community
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Medical record (chart) audit • Multisource feedback • Portfolio • Reflection • Simulation
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • Institute of Healthcare Improvement website (http://www.ihl.org/Pages/default.aspx) which includes multiple choice tests, reflective writing samples, and more • Silver SA, Harel Z, McQuillan R, et al. How to begin a quality improvement project. CJASN. 2016 May; 11(5) 893-900. https://cjasn.asnjournals.org/content/11/5/893 2020

Systems-Based Practice 2: System Navigation for Patient-Centered Care Overall Intent: To effectively navigate the health care system, including the interdisciplinary team and other care providers, to adapt care to a specific patient population to ensure high-quality patient outcomes	
Milestones	Examples
Level 1 <i>Demonstrates knowledge of care coordination</i> <i>Identifies key elements for safe and effective transitions of care/hand-offs</i>	<ul style="list-style-type: none"> • For a patient with end-stage kidney disease, identifies the dialysis nurse, renal nutritionist, and social workers as members of the team • Lists the essential components of effective care transition and hand-off between fellow colleagues
Level 2 <i>Coordinates care of patients in routine clinical situations effectively using the roles of interprofessional teams within nephrology</i> <i>Performs safe and effective transitions of care/hand-offs in routine clinical situations</i>	<ul style="list-style-type: none"> • Coordinates care with the outpatient dialysis center at the time of discharge from the hospital • Routinely uses a care transition tool to alert colleagues when daily activities are complete
Level 3 <i>Coordinates care of patients in complex clinical situations effectively using the roles of interprofessional teams within nephrology</i> <i>Performs safe and effective transitions of care/hand-offs in complex clinical situations</i>	<ul style="list-style-type: none"> • Works with the social worker to coordinate care for dialysis patients that will ensure compliance with their outpatient dialysis sessions • Routinely uses a care transition tool when transferring a patient to and from the intensive care unit (ICU)
Level 4 <i>Demonstrates effective coordination of patient-centered care across different disciplines and specialties</i> <i>Advocates for safe and effective transitions of care/hand-offs within and across health care delivery systems, including outpatient settings</i>	<ul style="list-style-type: none"> • During inpatient rotations, leads team members in approaching consultants to review cases/recommendations and arranges kidney biopsy pathology review for the team • Prior to going on vacation, proactively informs the covering fellow about a plan of care for a complex continuous renal replacement therapy patient
Level 5 <i>Analyzes the process of care coordination and leads in the design and implementation of improvements</i> <i>Advances quality of transitions of care within and across health care delivery systems to optimize patient outcomes</i>	<ul style="list-style-type: none"> • Develops new education programs for dialysis patients in home therapy options • Develops a protocol to improve transitions to home dialysis therapies
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Medical record (chart) audit

	<ul style="list-style-type: none"> • Multisource feedback • Observable structured clinical examination • Quality metrics • Review of sign-out tools, use and review of checklists
Curriculum Mapping	•
Notes or Resources	<ul style="list-style-type: none"> • CDC. Population Health Training in Place Program (PH-TIPP) https://www.cdc.gov/pophealthtraining/whatis.html. Accessed 2019. • Kaplan KJ. In pursuit of patient-centered care. March 2016. http://tissuepathology.com/2016/03/29/in-pursuit-of-patient-centered-care/#axzz5e7nSsAns Accessed 2019. • Skochelak SE, Hawkins RE, Lawson LE, etc. al; <i>AMA Education Consortium: Health Systems Science</i>. Elsevier. 2016.

Systems-Based Practice 3: Population Health	
Overall Intent: To adapt practice to meet the needs of specific populations	
Milestones	Examples
Level 1 <i>Demonstrates knowledge of population and community health needs</i>	<ul style="list-style-type: none"> • Finds yearly outcomes data on end-stage renal disease patients through United States Renal Data System (USRDS) data
Level 2 <i>Identifies specific population and community health needs for the local population</i>	<ul style="list-style-type: none"> • Reviews dialysis unit specific outcomes data as compared to USRDS data
Level 3 <i>Uses local resources effectively to meet the needs of a patient population and community</i>	<ul style="list-style-type: none"> • Reviews with multifunctional team to develop methods of addressing unfairness in dialysis care
Level 4 <i>Participates in changing and adapting practice to provide for the needs of specific populations</i>	<ul style="list-style-type: none"> • Advocates for adjustment in dialysis schedules to meet needs of dialysis population • Identifies a kidney disease consortium to enroll patients with glomerulonephritis in a study
Level 5 <i>Leads innovations and advocates for populations and communities with specific health care needs</i>	<ul style="list-style-type: none"> • Develops a proposal for telemedicine service to monitor dialysis patients' disease status
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Medical record (chart) audit • Multisource feedback
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • USRDS database https://www.usrds.org/ Accessed 2019.

Systems-Based Practice 4: Physician Role in Health Care Systems Overall Intent: To understand his/her role in the complex health care system and how to optimize the system to improve patient care and the health system's performance	
Milestones	Examples
Level 1 <i>Identifies key components of the complex health care system</i> <i>Describes basic health payment systems, including practice models</i>	<ul style="list-style-type: none"> • Understands how patients receive Medicare after starting dialysis • Understands the impact of health plan coverage on prescription drugs for individual patients
Level 2 <i>Describes how components of a complex health care system are interrelated, and how this impacts patient care</i> <i>Delivers care with consideration of each patient's payment model</i>	<ul style="list-style-type: none"> • Prioritizes and triages more critically ill inpatients via communication between the dialysis nursing staff and primary team • Takes into consideration patient's prescription drug coverage when choosing a binder for treatment of hyperphosphatemia
Level 3 <i>Discusses how individual practice affects the broader system</i> <i>Engages with patients in shared decision making, informed by each patient's payment models</i>	<ul style="list-style-type: none"> • Ensures that patient with acute kidney infection or chronic kidney disease has a scheduled follow-up appointment at discharge minimize risk of readmission • Communicates the post-discharge treatment plan to a patient's primary nephrologist • Understands that patient engagement is essential to any therapeutic plan and that the patient is the most important member of the health care team
Level 4 <i>Manages various components of the complex health care system to provide efficient and effective patient care and transitions of care</i> <i>Advocates for patient care needs with consideration of the limitations of each patient's payment model</i>	<ul style="list-style-type: none"> • Explains that improving patient satisfaction impacts patient adherence and payment to the health system • Works collaboratively to improve patient assistance resources for a patient with limited resources
Level 5 <i>Advocates for or leads systems change that enhances high-value, efficient, and effective patient care and transitions of care</i> <i>Participates in health policy advocacy activities</i>	<ul style="list-style-type: none"> • Works with community or professional organizations to organize events that raise awareness of kidney disease • Improves informed consent process for non-English-speaking patients requiring interpreter services
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Medical record (chart) audit • Patient satisfaction data

	<ul style="list-style-type: none"> ● Portfolio
Curriculum Mapping	<ul style="list-style-type: none"> ●
Notes or Resources	<ul style="list-style-type: none"> ● Agency for Healthcare Research and Quality (AHRQ): The Challenges of Measuring Physician Quality https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/challenges.html 2016. ● AHRQ. Major physician performance sets: https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/measurementsets.html 2018. ● The Kaiser Family Foundation: Topic: health reform: https://www.kff.org/topic/health-reform/ 2019. ● The National Academy for Medicine, Dzau VJ, McClellan M, Burke S, et al. Vital directions for health and health care: priorities from a National Academy of Medicine Initiative. March 2016. https://nam.edu/vital-directions-for-health-health-care-priorities-from-a-national-academy-of-medicine-initiative/ ● The Commonwealth Fund. Health system data center. 2017. http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1 ● The Commonwealth Fund. Health reform resource center: http://www.commonwealthfund.org/interactives-and-data/health-reform-resource-center#/f:@facasubcategoriesfacet63677=[Individual%20and%20Employer%20Responsibility ● American Board of Internal Medicine. QI/PI activities. Practice Assessment: Modules that physicians can use to assess clinical practice. 2019. http://www.abim.org/maintenance-of-certification/earning-points/practice-assessment.aspx ● Patient and Family Engagement (PFE)- IPRO ESRD Network

Practice-Based Learning and Improvement 1: Evidence-Based and Informed Practice Overall Intent: To incorporate evidence and patient values into clinical practice	
Milestones	Examples
Level 1 <i>Demonstrates how to access and use available evidence, and incorporates patient preferences and values in order to care for a routine patient</i>	<ul style="list-style-type: none"> • Uses published Kidney Disease Improving Global Outcomes (KDIGO) guidelines for management of anemia to minimize blood transfusions in the patient
Level 2 <i>Articulates clinical questions and elicits patient preferences and values in order to guide evidence-based care</i>	<ul style="list-style-type: none"> • Recommends placement of a left radio-cephalic arteriovenous fistula in a right-handed 35-year-old patient without peripheral vascular disease
Level 3 <i>Locates and applies the best available evidence, integrated with patient preference, to the care of complex patients</i>	<ul style="list-style-type: none"> • Discusses fertility risk of cyclophosphamide in a young woman with lupus nephritis and whether to use an alternative agent.
Level 4 <i>Critically appraises and applies evidence even in the face of uncertainty and conflicting evidence to guide care, tailored to the individual patient</i>	<ul style="list-style-type: none"> • Discusses treatment of calciphylaxis with a patient on peritoneal dialysis which includes switching dialysis modalities and administration of intravenous sodium thiosulfate • Recognizes gaps in medical understanding and refers patient to a clinical study
Level 5 <i>Coaches others to critically appraise and apply evidence for complex patients and/or participates in the development of guidelines</i>	<ul style="list-style-type: none"> • Leads clinical teaching on application of best practices in critical appraisal of chronic kidney disease criteria • As part of a team, develops an acute kidney injury management protocol for the emergency department
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Oral or written examinations • Presentation evaluation • Research portfolio
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • Kidney Disease Improving Global Outcomes (KDIGO) CKD evaluation and management. https://kdigo.org/guidelines/ckd-evaluation-and-management/ Accessed 2019.

Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Personal Growth Overall Intent: To seek clinical performance information with the intent to improve care; reflect on all domains of practice, personal interactions, and behaviors, and their impact on colleagues and patients (reflective mindfulness); develop clear objectives and goals for improvement in some form of a learning plan	
Milestones	Examples
Level 1 <i>Accepts responsibility for personal and professional development by establishing goals</i> <i>Identifies the factors that contribute to gap(s) between expectations and performance</i> <i>Actively seeks opportunities to improve</i>	<ul style="list-style-type: none"> • Sets a personal practice goal of documenting chronic kidney disease stage including albuminuria in patient charts • Identifies gaps in knowledge in causes of glomerulonephritis • Asks for feedback from patients, families, and patient care team members
Level 2 <i>Demonstrates openness to performance data (feedback and other input) in order to inform goals</i> <i>Analyzes and reflects on the factors that contribute to gap(s) between expectations and performance</i> <i>Designs and implements a learning plan, with prompting</i>	<ul style="list-style-type: none"> • Integrates feedback to adjust the documentation of severity of acute kidney infection in clinical notes • Assesses time management skills and how it impacts timely completion of clinic notes and literature reviews • When prompted, develops individual education plan to improve their evaluation of kidney stones
Level 3 <i>Seeks and incorporates performance data episodically into practice, with adaptability and insight</i> <i>Analyzes, reflects on, and institutes behavioral change(s) to narrow the gap(s) between expectations and performance</i> <i>Independently creates and implements a learning plan</i>	<ul style="list-style-type: none"> • Completes a chart audit to determine the percent of patients in chronic kidney disease clinic who have received the Hepatitis B vaccine • Completes a literature review prior to complex patient encounters • Using web-based resources, creates a personal curriculum to improve his/her evaluation of glomerulonephritis
Level 4 <i>Seeks and incorporates performance data consistently into practice, with adaptability and insight</i>	<ul style="list-style-type: none"> • Completes a quarterly chart audit to ensure their dialysis patients phosphorous is at goal

<p><i>Challenges assumptions and considers alternatives in narrowing the gap(s) between expectations and performance</i></p> <p><i>Uses performance data to measure the effectiveness of the learning plan, and when necessary, improves it</i></p>	<ul style="list-style-type: none"> • After a challenging patient encounter, debriefs with the attending and other patient care team members to optimize future collaboration in the care of the patient and family • Performs a chart audit on personal documentation of their evaluation of glomerulonephritis
<p>Level 5 <i>Role models consistently seeking performance data, with adaptability and insight</i></p> <p><i>Coaches others on reflective practice</i></p> <p><i>Facilitates the design and implementation of learning plans for others</i></p>	<ul style="list-style-type: none"> • Models practice improvement and adaptability • Develops educational module for collaboration with other patient care team members • Assists junior trainees in developing their individualized learning plans
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Review of learning plan • Medical record (chart) audit
Curriculum Mapping	
Notes or Resources	<ul style="list-style-type: none"> • Kidney Disease Improving Global Outcomes (KDIGO) CKD evaluation and management. https://kdigo.org/guidelines/ckd-evaluation-and-management/ Accessed 2019. • Ahya SN, Barsuk JH, Cohen ER, Tuazon J, McGaghie WC, Wayne DB. Clinical performance and skill retention after simulation-based education for nephrology fellows. <i>Semin Dial.</i> 2012 Jul;25(4):470-3.

Professionalism 1: Professional Behavior and Ethical Principles Overall Intent: To demonstrate ethical and professional behavior, recognize and address lapses in ethical and professional behavior, and use appropriate resources for managing ethical and professional dilemmas	
Milestones	Examples
Level 1 <i>Demonstrates professional behavior in routine situations</i> <i>Demonstrates use of the ethical principles underlying informed consent, surrogate decision making, advance directives, and confidentiality</i>	<ul style="list-style-type: none"> • Respectfully interacts with colleagues in the consultant role • Checks patient's understanding when seeking informed consent to ensure that the medical team's actions are consistent with the patient's care directives
Level 2 <i>Demonstrates professional behavior in complex or stressful situations</i> <i>Uses ethical principles to address error disclosure and stewardship of limited resources</i>	<ul style="list-style-type: none"> • Respectfully interacts with colleagues even when census is high, post-call, etc. • Prioritizes overnight dialysis of a patient presenting with severe hyperkalemia over a stable patient scheduled for transplant the next day
Level 3 <i>Recognizes potential triggers and takes responsibility for professionalism lapses</i> <i>Analyzes complex situations using ethical principles, and seeks help when necessary</i>	<ul style="list-style-type: none"> • Apologizes to nursing staff member for insisting on a particular management strategy when a collaborative approach may have been more effective • Engages the family of a terminally ill patient on renal replacement therapy and engages palliative care to help navigate complex family dynamics
Level 4 <i>Recognizes situations that may trigger professionalism lapses and intervenes to prevent lapses in self and others</i> <i>Recognizes and uses appropriate resources for managing and resolving ethical dilemmas (e.g., ethics consultations, literature review, risk management/legal consultation)</i>	<ul style="list-style-type: none"> • Demonstrates empathy and respect for patients when wait times have been excessive • Identifies fatigue or burnout in a colleague as a potential source of professionalism lapse and proposes an alternate call schedule • Recognizes and uses ethics consults, literature, and risk-management/legal counsel in order to resolve ethical dilemmas
Level 5 <i>Coaches others when their behavior fails to meet professional expectations</i> <i>Serves as a resource for others to help work through complex ethical situations</i>	<ul style="list-style-type: none"> • Helps colleagues create a performance improvement plan to prevent future professionalism lapses • Engages stakeholders to address excessive wait times in clinic to decrease patient and clinician frustrations that lead to unprofessional behavior
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Multisource feedback • Oral or written self-reflection • Simulation

Curriculum Mapping	•
Notes or Resources	<ul style="list-style-type: none"> • American Medical Association Code of Ethics. https://www.ama-assn.org/delivering-care/ama-code-medical-ethics Accessed 2019. • American Board of Internal Medicine; American College of Physicians-American Society of Internal Medicine; European Federation of Internal Medicine. Medical professionalism in the new millennium: a physician charter. <i>Ann Intern Med</i>. 2002;136:243-246. http://abimfoundation.org/wp-content/uploads/2015/12/Medical-Professionalism-in-the-New-Millennium-A-Physician-Charter.pdf • Bynny RL, Papadakis MA, Paauw DS. Medical Professionalism Best Practices. Alpha Omega Alpha Medical Society, Menlo Park, CA. 2015. https://alphaomegaalpha.org/pdfs/2015MedicalProfessionalism.pdf • Levinson W, Ginsburg S, Hafferty FW, Lucey CR. <i>Understanding Medical Professionalism</i>. McGraw-Hill Education; 2014. • Bynny RL, Papadakis MA, Paauw DS. Medical professionalism: best practices. 2015. ISBN: 978-0-578-16072-6 • Bynny RL, Paauw DS, Papadakis MA, Pfeil S. Medical professionalism. Best practices: professionalism in the modern era. 2017. ISBN: 978-1-5323-6516-4

Professionalism 2: Accountability/Conscientiousness Overall Intent: To take responsibility for one's own actions and their impact on patients and other members of the health care team	
Milestones	Examples
Level 1 <i>Takes responsibility for failure to complete tasks and responsibilities, identifies potential contributing factors, and describes strategies for ensuring timely task completion in the future</i> <i>Responds promptly to requests or reminders to complete tasks and responsibilities</i>	<ul style="list-style-type: none"> • Responds promptly to reminders from program administrator to complete work-hour logs • Maintains timely attendance at conferences • Completes end-of-rotation evaluations
Level 2 <i>Performs tasks and responsibilities in a timely manner with appropriate attention to detail in routine situations</i> <i>Recognizes situations that may impact own ability to complete tasks and responsibilities in a timely manner</i>	<ul style="list-style-type: none"> • Completes administrative tasks, documents safety modules, procedure review, and licensing requirements by specified due date • Before going out of town, ensures that patient care is covered and that outstanding tasks are assigned to others
Level 3 <i>Performs tasks and responsibilities in a timely manner with appropriate attention to detail in complex or stressful situations</i> <i>Proactively implements strategies to ensure that training requirements are met as assigned</i>	<ul style="list-style-type: none"> • Appropriately triages tasks and asks for assistance from other learners or faculty members as needed • Maintains procedure logs and self-identifies deficiencies; alerts program administrators if falling short of target number of kidney biopsies and proposes an additional rotation on the procedural service
Level 4 <i>Recognizes situations that may impact others' ability to complete tasks and responsibilities in a timely manner and offers to help</i>	<ul style="list-style-type: none"> • Notes a colleague's ill child and takes over their clinical duties unprompted
Level 5 <i>Offers and implements strategies to make systems-level care responsibilities more efficient</i>	<ul style="list-style-type: none"> • Notes gaps in the continuity of care of end-stage renal disease patients between inpatient and outpatient settings and meets with dialysis unit nurses to streamline hand-offs • Notes fatigue among fellow learners and proposes a system to relieve colleagues when too tired to work
Assessment Models or Tools	<ul style="list-style-type: none"> • Compliance with deadlines and timelines • Direct observation • Multisource feedback

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	<ul style="list-style-type: none">• Procedure logs• Self-evaluations and reflective tools
Curriculum Mapping	<ul style="list-style-type: none">•
Notes or Resources	<ul style="list-style-type: none">• Code of conduct from fellow/resident institutional manual

Professionalism 3: Self-Awareness and Help-Seeking Overall Intent: To identify, use, manage, improve, and seek help for personal and professional well-being for self and others	
Milestones	Examples
Level 1 <i>With assistance, recognizes status of personal and professional well-being</i>	<ul style="list-style-type: none"> • Acknowledges own emotional response to a complication in a kidney donor or the death of a young patient
Level 2 <i>Independently recognizes status of personal and professional well-being and seeks help when needed</i>	<ul style="list-style-type: none"> • Independently identifies and communicates impact of a personal challenge on one's ability to fully engage with work responsibilities
Level 3 <i>With assistance, proposes a plan to optimize personal and professional well-being</i>	<ul style="list-style-type: none"> • With the assistance of the program director, develops a plan to manage work responsibilities in the face of a personal challenge
Level 4 <i>Independently develops a plan to optimize personal and professional well-being (well-being survey, fatigue assessment)</i>	<ul style="list-style-type: none"> • Independently identifies ways to manage personal stress • Acknowledges and seeks assistance in handling emotions after an adverse outcome
Level 5 <i>Coaches others when emotional responses or limitations in knowledge/skills do not meet professional expectations</i>	<ul style="list-style-type: none"> • Assists in organizational efforts to address clinician well-being after difficult patient encounters or colleagues' personal challenges
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Group interview or discussions for team activities • Individual interview • Institutional online training modules • Self-assessment and personal learning plan
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • This subcompetency is not intended to evaluate a fellow's well-being, but to ensure each fellow has the fundamental knowledge of factors that impact well-being, the mechanisms by which those factors impact well-being, and available resources and tools to improve well-being. • Local resources, including Employee Assistance program • Hicks PJ, Schumacher D, Guralnick S, Carraccio C, Burke AE. Domain of competence: personal and professional development. <i>Acad Pediatr</i>. 2014 Mar-Apr;14(2 Suppl):S80-97. • ACGME "Well-Being Tools and Resources." https://dl.acgme.org/pages/well-being-tools-resources. Accessed 2022.

Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication Overall Intent: To deliberately use language and behaviors to form constructive relationships with patients, to identify communication barriers including self-reflection on biases, and minimize them in the doctor-patient relationships; to organize and lead communication around shared decision making	
Milestones	Examples
<p>Level 1 <i>Uses language and nonverbal behavior to demonstrate respect and establish rapport</i></p> <p><i>Identifies common barriers to effective communication (e.g., language, disability) while accurately communicating own role within the health care system</i></p> <p><i>Participates with stakeholders in setting the agenda, clarifying expectations, and verifying understanding of the clinical situation for shared decision making</i></p>	<ul style="list-style-type: none"> ● Introduces self and faculty member, identifies patient and others in the room, and engages all parties in health care discussion ● Uses a trained interpreter with non-English-speaking patients ● Encourages discussion with family members regarding choices for outpatient dialysis modality
<p>Level 2 <i>Establishes a therapeutic relationship in straightforward encounters using active listening and clear language</i></p> <p><i>Identifies complex barriers to effective communication (e.g., health literacy, cultural)</i></p> <p><i>With guidance, sensitively and compassionately delivers medical information, elicits patient/family values, goals and preferences, and acknowledges uncertainty and conflict</i></p>	<ul style="list-style-type: none"> ● Avoids medical jargon and restates the patient's perspective when discussing renal replacement therapy ● Provides handouts with diagrams and pictures to communicate information to a patient who is unable to read ● Leads a discussion with a patient and family regarding risks and benefits of initiating dialysis
<p>Level 3 <i>Establishes a therapeutic relationship in challenging patient encounters</i></p> <p><i>When prompted, reflects on biases while attempting to minimize communication barriers</i></p>	<ul style="list-style-type: none"> ● Acknowledges patient's dependence on NSAIDs for pain management in chronic arthritis and develops a kidney-protective therapeutic plan ● In a discussion with the faculty member, acknowledges discomfort in caring for a young patient with lupus nephritis who is not taking her immunosuppression as prescribed

<i>Adjusts communication strategies based on assessment of patient/family expectations and understanding of their health status and treatment options</i>	<ul style="list-style-type: none"> • Conducts a family meeting to determine a plan for a patient who is not doing well on home dialysis
<p>Level 4 <i>Easily establishes therapeutic relationships, with attention to patient/family concerns and context, regardless of complexity</i></p> <p><i>Independently recognizes biases while attempting to proactively minimize communication barriers</i></p> <p><i>Independently uses shared decision making to align patient/family values, goals, and preferences with treatment options to make a personalized care plan</i></p>	<ul style="list-style-type: none"> • Engages family members with differing goals in the care of a dialysis patient with dementia • Provides compassionate care to patients who are non-compliant with the dialysis prescription, diet, and/or medications, and involves the interdisciplinary team in addressing barriers to communication with such a patient • Uses patient, family, and when requested, pastoral care input to develop a plan for patients who desire to stop renal replacement therapy
<p>Level 5 <i>Mentors others in situational awareness and critical self-reflection to consistently develop positive therapeutic relationships</i></p> <p><i>Role models self-awareness while identifying a contextual approach to minimize communication barriers</i></p> <p><i>Role models shared decision making in patient/family communication including those with a high degree of uncertainty/conflict</i></p>	<ul style="list-style-type: none"> • Leads a discussion group on health barriers • Develops a residency curriculum on bias • Serves on a hospital bioethics committee
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Standardized patients • Self-reflection • Simulation
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • Laidlaw A, Hart J. Communication skills: an essential component of medical curricula. Part I: Assessment of clinical communication: AMEE Guide No. 51. <i>Med Teach</i>. 2011;33(1):6-8. • Makoul G. Essential elements of communication in medical encounters: The Kalamazoo consensus statement. <i>Acad Med</i>. 2001;76:390-393.

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| | <ul style="list-style-type: none">• Makoul G. The SEGUE Framework for teaching and assessing communication skills. <i>Patient Educ Couns</i>. 2001;45(1):23-34.• Symons AB, Swanson A, McGuigan D, Orrange S, Akl EA. A tool for self-assessment of communication skills and professionalism in fellows. <i>BMC Med Educ</i>. 2009; 9:1. |
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Interpersonal and Communication Skills 2: Interprofessional and Team Communication Overall Intent: To effectively communicate with the health care team, including consultants, in both straightforward and complex situations	
Milestones	Examples
Level 1 <i>Respectfully requests and/or receives a consultation request</i> <i>Communicates basic information with primary consulting service</i>	<ul style="list-style-type: none"> • When asking for a urology consultation for a patient with urinary tract obstruction, respectfully relays the diagnosis and need for intervention to relieve the obstruction • Following rounds, calls primary services to relay recommendations
Level 2 <i>Clearly and concisely requests and/or responds to a consultation request</i> <i>Communicates basic information effectively with the health care team</i>	<ul style="list-style-type: none"> • For a patient with acute kidney infection, communicates diagnostic evaluation recommendations clearly and concisely in an organized and timely manner to the primary service • Sends a message in the electronic health record to the dietician of a chronic kidney disease patient to provide education about dietary potassium restriction
Level 3 <i>Checks own understanding of consultant recommendations and/or understanding of recommendations when providing consultation</i> <i>Adapts communication style to fit team needs and uses language that values all members of the health care team</i>	<ul style="list-style-type: none"> • After a consultation has been completed, communicates with the primary care team members to verify that they have received and understand the recommendations • When conveying recommendations to a medical student, respectfully verifies understanding of recommendations and identifies opportunities for teaching
Level 4 <i>Coordinates recommendations from different members of the health care team to optimize patient care</i> <i>Communicates complex information effectively with the primary consulting service and other members of the health care team</i>	<ul style="list-style-type: none"> • Initiates a multidisciplinary meeting to discuss continuation of dialysis in a patient with multi-system organ failure • Patiently explains the absence of indications for dialysis in a critically ill patient to the medical ICU team • Asks other members of the health care team to repeat back recommendations to ensure understanding
Level 5 <i>Role models flexible communication strategies that value input from all health care team members, resolving conflict when needed</i>	<ul style="list-style-type: none"> • Mediates a conflict resolution between different members of the health care team
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Medical record (chart) audit • Multi-source feedback

	<ul style="list-style-type: none"> • Simulation
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • Roth CG, Eldin KW, Padmanabhan V, Freidman EM. Twelve tips for the introduction of emotional intelligence in medical education. Med Teach. 2018 Jul 21:1-4. doi: 10.1080/0142159X.2018.1481499. [Epub ahead of print] • Green M, Parrott T, Cook G., Improving your communication skills. BMJ 2012;344:e357 doi: https://doi.org/10.1136/bmj.e357 • Henry SG, Holmboe ES, Frankel RM. Evidence-based competencies for improving communication skills in graduate medical education: a review with suggestions for implementation. Med Teach. 2013 May; 35(5):395-403. doi: 10.3109/0142159X.2013.769677. • Dehon E, Simpson K, Fowler D, Jones A. Development of the faculty 360. MedEdPORTAL. 2015;11:10174 http://doi.org/10.15766/mep_2374-8265.10174 • Braddock CH, Edwards KA, Hasenberg NM, Laidley TL, Levinson W. JAMA 1999;282:2313-2320

Interpersonal and Communication Skills 3: Communication within Health Care Systems Overall Intent: To effectively communicate using a variety of methods	
Milestones	Examples
Level 1 <i>Accurately and professionally records information in the patient record</i> <i>Safeguards patient personal health information</i>	<ul style="list-style-type: none"> • Documents patient encounters accurately but with extraneous information • Shreds patient list after rounds; avoids talking about patients in the elevator • Adheres to HIPAA regulations
Level 2 <i>Documents diagnostic and therapeutic reasoning in the patient record in a timely manner</i> <i>Appropriately selects and uses direct (e.g., telephone, in-person) and indirect (e.g., progress notes, text messages) forms of communication based on context</i>	<ul style="list-style-type: none"> • Documents in the medical record the need for prompt diagnostic studies and initial treatment recommendations for a patient with hyponatremia • Directly discusses with the ICU team the diagnostic studies and management recommendations in a patient with severe hyponatremia
Level 3 <i>Demonstrates advanced diagnostic and therapeutic reasoning in the patient record</i> <i>Demonstrates effective use of direct (e.g., telephone, in-person) and indirect (e.g., progress notes, text messages) forms of communication based on context</i>	<ul style="list-style-type: none"> • Recommends appropriate testing for an ambulatory patient with newly diagnosed hypertensive chronic kidney disease and documents the lack of need for serologic testing • Engages the multidisciplinary team, including the social worker, primary care team, and family in outpatient dialysis placement • Calls a patient immediately about a potentially critical test result
Level 4 <i>Communicates clearly, concisely, in a timely manner, and in an organized written form, including anticipatory guidance</i> <i>Achieves written and/or verbal communication (patient notes, email, etc.) that serves as an example for others to follow</i>	<ul style="list-style-type: none"> • Communicates the initial plan with the primary care physician of a patient with glomerulonephritis, including monitoring and prophylaxis for complications from immunosuppression • Notes are used as examples for teaching purposes
Level 5 <i>Models feedback to improve others' written communication</i> <i>Guides departmental or institutional communication around policies and procedures</i>	<ul style="list-style-type: none"> • Leads a task force established by the nephrology division QI committee to improve weekend hand-offs • Works with the program director to develop policies regarding the use of continuous renal replacement therapy in the operating room

	<ul style="list-style-type: none"> • Talks directly to emergency department leadership about breakdowns in communication in order to prevent recurrence
Assessment Models or Tools	<ul style="list-style-type: none"> • Direct observation • Medical record (chart) audit • Multisource feedback
Curriculum Mapping	<ul style="list-style-type: none"> •
Notes or Resources	<ul style="list-style-type: none"> • Bierman JA, Hufmeyer KK, Liss DT, Weaver AC, Heiman HL. Promoting responsible electronic documentation: validity evidence for a checklist to assess progress notes in the electronic health record. <i>Teach Learn Med.</i> 2017 Oct-Dec;29(4):420-432. • Starmer, Amy J., et al. I-pass, a mnemonic to standardize verbal handoffs. <i>Pediatrics.</i> 2012;129.2:201-204. • Haig, K.M., Sutton, S., Whittington, J. SBAR: a shared mental model for improving communications between clinicians. <i>Jt Comm J Qual Patient Saf.</i> 2006 Mar;32(3):167-75.

Available Milestones Resources

Milestones 2.0: Assessment, Implementation, and Clinical Competency Committees Supplement, 2021 - <https://meridian.allenpress.com/jgme/issue/13/2s>

Milestones Guidebooks: <https://www.acgme.org/milestones/resources/>

- *Assessment Guidebook*
- *Clinical Competency Committee Guidebook*
- *Clinical Competency Committee Guidebook Executive Summaries*
- *Implementation Guidebook*
- *Milestones Guidebook*

Milestones Guidebook for Residents and Fellows: <https://www.acgme.org/residents-and-fellows/the-acgme-for-residents-and-fellows/>

- *Milestones Guidebook for Residents and Fellows*
- *Milestones Guidebook for Residents and Fellows Presentation*
- *Milestones 2.0 Guide Sheet for Residents and Fellows*

Milestones Research and Reports: <https://www.acgme.org/milestones/research/>

- *Milestones National Report*, updated each fall
- *Milestones Predictive Probability Report*, updated each fall
- *Milestones Bibliography*, updated twice each year

Developing Faculty Competencies in Assessment courses - <https://www.acgme.org/meetings-and-educational-activities/courses-and-workshops/developing-faculty-competencies-in-assessment/>

Assessment Tool: Direct Observation of Clinical Care (DOCC) - <https://dl.acgme.org/pages/assessment>

Assessment Tool: Teamwork Effectiveness Assessment Module (TEAM) - <https://team.acgme.org/>

Improving Assessment Using Direct Observation Toolkit - <https://dl.acgme.org/pages/acgme-faculty-development-toolkit-improving-assessment-using-direct-observation>

Remediation Toolkit - <https://dl.acgme.org/courses/acgme-remediation-toolkit>

Learn at ACGME has several courses on Assessment and Milestones - <https://dl.acgme.org/>