Nephrology Blueprint

Certification Examination (CERT)

Purpose of the exam

The exam is designed to evaluate the knowledge, diagnostic reasoning, and clinical judgment skills expected of the certified nephrologist in the broad domain of the discipline. The ability to make appropriate diagnostic and management decisions that have important consequences for patients will be assessed. The exam may require recognition of common as well as rare clinical problems for which patients may consult a certified nephrologist.

Exam content

Exam content is determined by a pre-established blueprint, or table of specifications. The blueprint is developed by the ABIM and is reviewed annually and updated as needed for currency. Trainees, training program directors, and certified practitioners in the discipline are surveyed periodically to provide feedback and inform the blueprinting process.

The primary medical content categories of the blueprint are shown below, with the percentage assigned to each for a typical exam:

Medical Content Category	% of Exam
Sodium and Water Abnormalities	8%
Acid-Base and Potassium Disorders	9%
Calcium, Phosphorus, and Magnesium Disorders and Stones	4%
Chronic Kidney Disease	22%
Hypertension	10%
Tubular, Interstitial, and Cystic Disorders	4%
Glomerular and Vascular Disorders	12%
Kidney Transplantation	11%
Pharmacology	5%
Acute Kidney Injury and Intensive Care Unit Nephrology	15%
	100%

Exam questions in the content areas above may also address clinical topics in adolescent medicine, critical care medicine, clinical epidemiology, geriatric medicine, and nutrition that are important to the practice of nephrology.

ABIM is committed to working toward health equity and believes that board-certified physicians should have an understanding of health care disparities. Therefore, health equity content that is clinically important to each discipline will be included in assessments, and the use of gender, race, and ethnicity identifiers will be re-evaluated.

Exam format

The exam is composed of up to 240 single-best-answer multiple-choice questions, of which approximately 40 are new questions that do not count in the examinee's score. Most questions describe patient scenarios and ask about the work done (that is, tasks performed) by physicians in the course of practice:

- Making a diagnosis
- Ordering and interpreting results of tests
- Recommending treatment or other patient care
- Assessing risk, determining prognosis, and applying principles from epidemiologic studies
- Understanding the underlying pathophysiology of disease and basic science knowledge applicable to patient care

Clinical information presented may include patient photographs, ultrasound images, angiograms, micrographs, radiographs, electrocardiograms, and other media to illustrate relevant patient findings. Learn more information on how exams are developed.

A tutorial including examples of ABIM exam question format can be found at http://www.abim.org/certification/exam-information/nephrology/exam-tutorial.aspx.

The blueprint can be expanded for additional detail as shown below. Each of the medical content categories is listed there, and below each major category are the content subsections and specific topics that *may* appear in the exam. Please note: actual exam content may vary.

Sodium and Water Abnormalities	**8%** of Exam
Hyponatremia	3%
Hypotonic	
Syndrome of inappropriate antidiuretic hormone secretion (SIADH)	
Hypervolemic	
Low solute intake	
Thiazides	
Other hypotonic (secondary adrenal insufficiency)	
Hypertonic	
Isotonic (pseudohyponatremia)	
Hypernatremia or serum hyperosmolality	<2%
Osmotic diuresis	
Urea	
Glucose	
Water diuresis	
Central diabetes insipidus	
Nephrogenic diabetes insipidus	
Other water diuresis (physiologic saline diuresis)	
Other hypernatremia or serum hyperosmolality (hypodipsia; extrarenal water loss)	
Salt excess (edema)	2.5%
Heart failure	
Cirrhosis	
Nephrotic syndrome	
Chronic kidney disease	
Salt depletion	<2%
Renal sodium losses	
Postobstructive diuresis	
Post-acute kidney injury diuresis	
Salt-wasting nephropathy	
Diuretics	
Other renal sodium losses (chemotherapy-induced)	
Extrarenal sodium losses	
Polyuria	<2%
Primary polydipsia	
Other polyuria (iatrogenic)	

Acid-Base and Potassium Disorders — **9%** of Exam

- **Metabolic acidosis** — 3.5%
  - Metabolic acidosis (normal anion gap)
    - Renal tubular acidosis (normokalemic or hypokalemic)
    - Renal tubular acidosis (hyperkalemic)
    - Nonrenal causes
  - Metabolic acidosis (elevated anion gap)
    - Lactic acidosis
    - Ketoacidosis
    - Toxins
    - Uremic
  - Other metabolic acidosis (low anion gap in multiple myeloma)
- **Metabolic alkalosis** — <2%
  - Associated with normal or low blood pressure
    - Renal origin
    - Other metabolic alkalosis associated with normal or low blood pressure (chemotherapy-induced; hypokalemia; post-hypercapnic)
  - Associated with high blood pressure
    - Adrenal
    - Other metabolic alkalosis associated with high blood pressure (malignant hypertension)
- **Respiratory acid-base disturbances** — <2%
  - Respiratory acidosis
  - Respiratory alkalosis
- **Mixed acid-base disturbances** — <2%
- **Potassium disturbances** — 3.5%
  - Hyperkalemia
    - Pseudohyperkalemia
    - Transcellular shifts
    - Medication-induced
    - Genetic abnormalities
    - Other tubular disorders (hepatitis-associated)
    - Postsurgical
    - Other hyperkalemia (peritoneal dialysis)
  - Hypokalemia
    - Pseudohypokalemia
    - Transcellular shifts

- Renal losses
- Nonrenal losses
- Other hypokalemia (combined therapeutic hypothermia and barbiturate coma)

Calcium, Phosphorus, and Magnesium Disorders and Stones — **4%** of Exam

- **Disorders of calcium metabolism** — **<**2%
  - Hypercalcemia
    - Primary hyperparathyroidism
    - Granulomatous diseases
    - Malignancy
    - Familial hypocalciuric hypercalcemia (FHH)
    - Vitamin D toxicity
    - Medication and vitamin-induced
    - Milk alkali syndrome
  - Hypocalcemia
    - Hypoparathyroidism
    - Pseudohypoparathyroidism
    - Medication-induced
    - Tissue deposition
    - Vitamin D deficiency
- **Disorders of phosphate metabolism** — <2%
  - Hyperphosphatemia
    - Decreased renal excretion
    - Increased intake
    - Tissue redistribution
    - Genetic causes
  - Hypophosphatemia
    - Increased renal excretion
    - Decreased intake and gastrointestinal absorption
    - Tissue redistribution
- **Disorders of magnesium metabolism** — <2%
  - Hypermagnesemia
    - Decreased renal excretion
    - Increased intake
  - Hypomagnesemia
    - Increased renal excretion
    - Decreased gastrointestinal absorption

Nephrolithiasis <2%

- Calcium stones
  - Idiopathic hypercalciuria
  - Hypocitraturia
  - Hyperoxaluria
  - Primary hyperparathyroidism
  - Distal renal tubular acidosis
  - Other calcium stones (medullary sponge kidney; hypercalciuria in hypoparathyroidism)
- Uric acid stones
  - Idiopathic
  - Other uric acid (postileostomy)
- Struvite stones
- Cystine stones
- Drug stones

Chronic Kidney Disease — **22%** of Exam

Kidney function parameters <2%

- Glomerular filtration rate (creatinine clearance; estimated glomerular filtration rate)
- Proteinuria
- Other kidney function parameters (glycemic control; biopsy)

Etiologies of chronic kidney disease <2%

- Diabetic kidney disease
- Nondiabetic kidney disease
  - Chronic glomerulonephritis
  - Hypertensive nephropathy
  - Chronic interstitial nephritis
  - Genetic diseases

Progression of chronic kidney disease <2%

Chronic kidney disease complications <2%

- Hypertension
- Fluid overload
- Anemia and iron deficiency
- Hyperkalemia
- Acidosis
- Protein-energy wasting

Other complications of chronic kidney disease (hyperparathyroidism; hyperphosphatemia)	
Stage 4 and 5 chronic kidney disease	<2%
Advanced uremic symptoms	
Preparation for end-stage kidney disease	
Initiation and discontinuation of maintenance dialysis	
Other stage 4 and 5 chronic kidney disease (parathyroid hormone monitoring)	
End-stage kidney disease	11.5%
Hemodialysis	
Adequacy and prescription	
Dialyzers and dialysate	
Vascular access	
Water treatment	
Hemodialysis complications	
Hypertension	
Hypotension	
Interdialytic weight gain	
Electrolyte abnormalities	
Vascular access complications (clotting, dysfunction, infection)	
Other hemodialysis complications (embolism and thrombosis; heparin-induced thrombocytopenia; loss of residual renal function; hypoalbuminemia)	
Peritoneal dialysis	
Adequacy and prescription	
Dialysate	
Catheters	
Other peritoneal dialysis issues (hyperkalemia)	
Peritoneal dialysis complications	
Peritonitis and infections	
Ultrafiltration failure	
Other peritoneal dialysis complications (inguinal hernia; atrial fibrillation; peripheral edema)	
Home hemodialysis	
End-stage kidney disease complications	
Anemia	
Cardiovascular disease	
Blood pressure abnormalities	

- Other complications (hemolysis; hypoalbuminemia; thrombosis; calciphylaxis; uremic polyneuropathy)
- Medical director responsibilities and conditions of coverage

Mineral bone disease 3%

- Laboratory abnormalities
  - Hyperphosphatemia
  - Hyperparathyroidism
  - Other laboratory abnormalities (calcium balance)
- Renal osteodystrophy (and related pathophysiology)
  - Osteitis fibrosis
  - Adynamic bone disease
  - Osteomalacia
  - Mixed uremic osteodystrophy
  - Other renal osteodystrophy, including low bone mass (osteoporosis)
- Extraosseous and vascular calcification
  - Medial calcification
  - Calciphylaxis
  - Other extraosseous and vascular calcification, including visceral organs

Special topics in chronic kidney disease <2%

- Epidemiology
- Ethical considerations
- Pregnancy
- Dermatology
- Nephrotoxicity of environmental and occupational agents
  - Lead
  - Organic solvents
  - Other nephrotoxicity of environmental and occupational agents (cadmium; mercury)
- Other special topics in chronic kidney disease (obesity)

Hypertension — **10%** of Exam

Essential hypertension 3.5%

- Isolated systolic hypertension
- Severe hypertension
- Resistant hypertension

- White coat hypertension
- Pseudohypertension
- Masked hypertension
- Other essential hypertension (stage 2 hypertension; thiazide effect)

Secondary causes of hypertension 4%

- Pheochromocytoma
- Renal vascular disease
  - Dissection
  - Atherosclerotic
- Hyperaldosteronism
  - Adrenal adenoma
  - Adrenal hyperplasia
- Genetic causes
  - Liddle syndrome
  - Dexamethasone suppressible hyperaldosteronism
  - Other genetic causes (Hashimoto's thyroiditis; scleroderma renal crisis)
- Miscellaneous causes
  - Renin-secreting tumor (juxtaglomerular cell tumor)
  - Syndrome of apparent mineralocorticoid excess
  - Coarctation
  - Vasculitis and arteritis
  - Tuberous sclerosis
  - Sleep apnea
  - Drug-induced
  - Obstructive uropathy
  - Renal compression (Page kidney)
  - Cushing syndrome
  - Other miscellaneous causes (chronic kidney disease; obesity)

End-organ damage resulting from hypertension <2%

- Acute kidney injury
- Central nervous system and ophthalmologic
- Cardiac (left ventricular hypertrophy; heart failure)

Hypertension in special situations <2%

- Pregnancy
- Stroke or subarachnoid bleeding
- Other hypertension in special situations

Tubular, Interstitial, and Cystic Disorders — **4%** of Exam

- **Renal tubular disorders and Fanconi's syndrome** <2%
  - Drug-induced
  - Crystal deposition
  - Genetic
- **Tubulointerstitial nephritis** 2%
  - Acute
    - Drug-induced
    - Immune
    - Infectious
    - Other acute tubulointerstitial nephritis (multifactorial)
  - Chronic
    - Drug-induced
    - Immune
    - Granulomatous
    - Toxins
    - Hemoglobinopathy
    - Urinary tract infection
    - Other chronic tubulointerstitial nephritis (hypokalemic nephropathy; medullary cystic kidney)
- **Renal cystic disease** <2%
  - Autosomal dominant polycystic kidney disease (ADPKD)
    - Genetics
    - Renal manifestations
    - Nonrenal manifestations
    - End-stage kidney disease
  - Drug-induced
- **Renal mass** <2%

Glomerular and Vascular Disorders — **12%** of Exam

- **Nephritic glomerular disorders, vasculitis, and vasculopathy** 5%
  - IgA nephropathy and IgA-associated vasculitis (Henoch-Schönlein purpura)
  - Vasculitis and antineutrophil cytoplasmic antibody
  - Anti-glomerular basement membrane disease
  - Lupus nephritis
  - Postinfectious glomerulonephritis

- Membranoproliferative glomerulonephritis and C3 glomerulopathies
- Cryoglobulinemic glomerulonephritis
- Crescentic glomerulonephritis
- Other disorders (rapidly progressive glomerulonephritis)

Nephrotic and heavy-proteinuric glomerular disorders 5%

- Minimal change disease
  - Primary
  - Secondary
- Focal segmental glomerulosclerosis
  - Primary
  - Secondary
  - Genetic
- Membranous nephropathy
  - Primary
  - Secondary
- Paraprotein-related disorders
  - Primary amyloidosis
  - Secondary amyloidosis
  - Light chain deposition disease and myeloma
  - Other paraprotein-related disorders
- Fibrillary and immunotactoid glomerulonephritis
- Fabry's disease
- Other disorders (biopsy complication)

Thin basement membrane nephropathy and Alport's syndrome <2%

Thrombotic microangiopathies <2%

Hemolytic uremic syndrome <2%

- Shiga toxin-mediated hemolytic uremic syndrome
- Complement-mediated thrombotic microangiopathy (atypical hemolytic uremic syndrome)
  - Drug-associated complement-mediated thrombotic microangiopathy (atypical hemolytic uremic syndrome) (anticancer drugs, clopidogrel, interferon, hemolytic uremic syndrome)
  - Other complement-mediated thrombotic microangiopathy (atypical hemolytic uremic syndrome) (pregnancy-associated)

Scleroderma renal disease <2%

Kidney Transplantation	**11%** of Exam

- **Pre-transplantation** <2%
  - Transplant immunology
    - Detection of pre-transplant alloreactivity and immunologic evaluation of transplant candidates
  - Potential kidney transplant recipient evaluation
    - Glomerular filtration rate listing requirements
    - Cancer concerns
    - Infection concerns
    - Cardiac concerns
    - Age concerns
    - Comorbidities
    - Other potential kidney transplant recipient evaluation (recurrent autoimmune kidney disease)
  - Potential living kidney donor
    - Donor evaluation
    - Risks
    - Ethics
  - Organ allocation
    - Deceased donor wait list
    - Organ shortage strategies
    - Paired kidney donation and chains
- **Transplantation** <2%
  - Indications
  - Contraindications
  - Deceased donor kidney transplantation
    - Types
    - Outcomes
  - Living donor kidney transplant
    - Types
    - Outcomes
- **Post-transplantation** 7%
  - Immunosuppression
    - Induction
    - Maintenance
  - Short-term post-transplantation management
    - Perioperative management and complications
    - Graft dysfunction

- Long-term post-transplantation management
  - Graft dysfunction
  - Complications
  - Other long-term post-transplantation management (graft failure)
- Rejection
  - Hyperacute
  - T cell
  - Antibody-mediated
- Male and female fertility
  - Pregnancy
  - Male fertility

Multiorgan and extrarenal transplantation <2%

Ethics, society, and public policy <2%

Pharmacology — **5%** of Exam

Basic pharmacology <2%

- Pharmacokinetics and other basic concepts
- Renal handling of drugs
- Principles of dialytic drug removal

Drug selection in kidney disease <2%

- Antibiotics
  - Vancomycin
  - Aminoglycosides
  - Other antibiotics (cephalosporins)
- Antineoplastic agents
- Antiviral agents
- Other drug selection in kidney disease (metformin; fentanyl)

Nephrotoxicity of medications 2%

- Principles and mechanisms of nephrotoxicity
- Antibacterial agents
  - Aminoglycosides
  - Vancomycin
- Antiviral agents
- Antifungal agents
- Antiparasitic agents
- Additional antimicrobials

- Pain medications
  - Nonsteroidal anti-inflammatory drugs
  - Fentanyl
  - Gabapentin
  - Tramadol
  - Propofol
- Renin-angiotensin-aldosterone system (RAAS) blockade
  - Angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, and renin inhibitors
  - Aldosterone antagonists
- Antihypertensive agents
  - Beta-adrenergic blockers
  - Calcium channel blockers
  - Minoxidil
- Antineoplastic chemotherapy agents
  - Interferon
  - Cisplatin
  - Methotrexate
  - Vascular endothelial growth factor inhibitors
  - Immune checkpoint inhibitors
- Iodinated contrast and other imaging agents
- Lithium
- Supplements and herbs
  - Aristolochic acid
- SGLT2 inhibitors
- Other nephrotoxicity of medications (cardiac glycosides; bisphosphonates)

Nephrotoxicity of illicit drugs <2%

- Heroin and other intravenous drugs
- Ecstasy
- Cocaine

Drug-drug interactions and adverse effects other than nephrotoxicity <2%

Dialysis and other treatment of toxic substances <2%

- Ethylene glycol
- Methanol
- Other alcohols
- Lithium
- Other dialysis and treatment of toxic substances (salicylates; dialysis duration prescription)

Acute Kidney Injury and Intensive Care Unit Nephrology	**15%** of Exam

- **Hemodynamic (prerenal) acute kidney injury** — 4%
  - True volume depletion
    - Renal
    - Extrarenal
  - Effective volume depletion
    - Heart failure
    - Cirrhosis
    - Nephrotic syndrome
  - Drugs
    - Nonsteroidal anti-inflammatory drugs
    - Calcineurin inhibitors
    - Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers
    - Radiocontrast agents
    - Other drugs (anticoagulants; interferon)
  - Abdominal compartment syndrome
- **Parenchymal (intrinsic) acute kidney injury** — 4.5%
  - Vascular
    - Systemic diseases and vasculitis
    - Atheroemboli
    - Renal vein thrombosis
  - Glomerular
    - Drug-induced
    - Infectious
    - Other glomerular parenchymal acute kidney injury (relapsed microscopic polyangiitis)
  - Tubular
    - Ischemic
    - Nephrotoxic
    - Systemic disease
  - Interstitial
    - Drugs
    - Systemic disease
    - Malignancy (infiltrative)

Postrenal acute kidney injury	<2%
Retroperitoneal and ureteral	
Idiopathic retroperitoneal fibrosis	
Malignancy	
Stones and crystals	
Bleeding	
Bladder, bladder outlet, and benign prostatic hyperplasia	
Kidney replacement therapy	4%
Indications	
Solute accumulation (potassium, hydrogen ions, phosphate, urea)	
Hemodynamic	
Acute kidney injury associated with intoxication	
Tumor lysis syndrome	
Techniques	
Intermittent hemodialysis	
Continuous kidney replacement therapy	
Kidney replacement therapy prescription	
Dialysate and replacement fluid	
Anticoagulation	
Complications	
Hemodynamic	
Citrate intoxication	
Other complications (dialysis disequilibrium syndrome, electrolyte abnormalities)	
Intensive care unit nephrology	2%
Hemodynamic measures	
Intravenous fluids and volume status	
Ethics and palliative care	

January 2024