Nephrology
Certification Examination Blueprint

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:

<table>
<thead>
<tr>
<th>Medical Content Category</th>
<th>% of Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium and Water Abnormalities</td>
<td>8%</td>
</tr>
<tr>
<td>Acid-Base and Potassium Disorders</td>
<td>10%</td>
</tr>
<tr>
<td>Calcium, Phosphorus, and Magnesium Disorders and Stones</td>
<td>4%</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>20%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>10%</td>
</tr>
<tr>
<td>Tubular, Interstitial, and Cystic Disorders</td>
<td>4%</td>
</tr>
<tr>
<td>Glomerular and Vascular Disorders</td>
<td>12%</td>
</tr>
<tr>
<td>Kidney Transplantation</td>
<td>10%</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>8%</td>
</tr>
<tr>
<td>Acute Kidney Injury and Intensive Care Unit Nephrology</td>
<td>14%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
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.

**Exam format**

The exam is composed of multiple-choice questions with a single best answer, predominantly describing patient scenarios. Questions 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.

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

<table>
<thead>
<tr>
<th>Sodium and Water Abnormalities</th>
<th>8% of Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hyponatremia</strong></td>
<td>3%</td>
</tr>
<tr>
<td>Hypotonic</td>
<td></td>
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<tr>
<td>Syndrome of inappropriate antidiuretic hormone secretion (SIADH)</td>
<td></td>
</tr>
<tr>
<td>Hypervolemic</td>
<td></td>
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<tr>
<td>Low solute intake</td>
<td></td>
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<tr>
<td>Thiazides</td>
<td></td>
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<tr>
<td>Other hypotonic (secondary adrenal insufficiency)</td>
<td></td>
</tr>
<tr>
<td>Hypertonic</td>
<td></td>
</tr>
<tr>
<td>Isotonic (pseudohyponatremia)</td>
<td></td>
</tr>
</tbody>
</table>
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
- Cerebral salt wasting
- Diuretics
- Other renal sodium losses (chemotherapy-induced)
Extrarenal sodium losses

Polyuria <2%
Primary polydipsia
Other polyuria (iatrogenic)

Acid-Base and Potassium Disorders 10% of Exam
Metabolic acidosis 4%
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 4%  
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  
Medications and vitamins
Milk alkali syndrome
Hypocalcemia
  Hypoparathyroidism
  Pseudohypoparathyroidism
  Medications
  Tissue deposition
  Vitamin D deficiency

Disorders of phosphate metabolism <2%
  Hyperphosphatemia
    Decreased renal excretion
    Increased intake
    Tissue redistribution
  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

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney function parameters</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Glomerular filtration rate</td>
<td></td>
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<tr>
<td>Proteinuria</td>
<td></td>
</tr>
<tr>
<td>Other kidney function parameters (glycemic control; biopsy)</td>
<td></td>
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<tr>
<td>Etiologies of chronic kidney disease</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Diabetic kidney disease</td>
<td></td>
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<tr>
<td>Nondiabetic kidney disease</td>
<td></td>
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<tr>
<td>Chronic glomerulonephritis</td>
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<tr>
<td>Hypertensive nephropathy</td>
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<tr>
<td>Chronic interstitial nephritis</td>
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<tr>
<td>Genetic diseases</td>
<td></td>
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<tr>
<td>Progression of chronic kidney disease</td>
<td>&lt;2%</td>
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<tr>
<td>Chronic kidney disease complications</td>
<td>&lt;2%</td>
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<tr>
<td>Hypertension</td>
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<tr>
<td>Fluid overload</td>
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<td>Anemia and iron deficiency</td>
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<td>Hyperkalemia</td>
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<td>Acidosis</td>
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<td>Protein-energy wasting</td>
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<tr>
<td>Other complications of chronic kidney disease</td>
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<tr>
<td>hyperparathyroidism; hypervitaminosis D; hyperphosphatemia</td>
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<tr>
<td>Stage IV and V chronic kidney disease</td>
<td>&lt;2%</td>
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<tr>
<td>Advanced uremic symptoms</td>
<td></td>
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<tr>
<td>Preparation for end-stage renal disease</td>
<td></td>
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<tr>
<td>Initiation and discontinuation of maintenance dialysis</td>
<td></td>
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<tr>
<td>Other stage IV and V chronic kidney disease</td>
<td></td>
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<tr>
<td>parathyroid hormone monitoring</td>
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<tr>
<td>End-stage renal disease</td>
<td>10.5%</td>
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<tr>
<td>Hemodialysis</td>
<td></td>
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<tr>
<td>Adequacy and prescription</td>
<td></td>
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<tr>
<td>Dialyzers and dialysate</td>
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<tr>
<td>Vascular access</td>
<td></td>
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<tr>
<td>Water treatment</td>
<td></td>
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<tr>
<td>Hemodialysis complications</td>
<td></td>
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<tr>
<td>Hypertension</td>
<td></td>
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<tr>
<td>Hypotension</td>
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<tr>
<td>Interdialytic weight gain</td>
<td></td>
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<tr>
<td>Electrolyte abnormalities</td>
<td></td>
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<tr>
<td>Vascular access complications (clotting, dysfunction, infection)</td>
<td></td>
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</tbody>
</table>
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 renal 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
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
Epidemiology
Ethical considerations
Pregnancy
Laboratory studies
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)

<table>
<thead>
<tr>
<th>Hypertension</th>
<th>10% of Exam</th>
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</thead>
<tbody>
<tr>
<td><strong>Essential hypertension</strong></td>
<td>3.5%</td>
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<tr>
<td>Isolated systolic hypertension</td>
<td></td>
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<tr>
<td>Malignant hypertension</td>
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<tr>
<td>Resistant hypertension</td>
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<td>White coat hypertension</td>
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<tr>
<td>Pseudohypertension</td>
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<tr>
<td>Masked hypertension</td>
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<tr>
<td>Other essential hypertension (stage 2 hypertension; thiazide effect)</td>
<td></td>
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<tr>
<td><strong>Secondary causes of hypertension</strong></td>
<td>4%</td>
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<tr>
<td>Pheochromocytoma</td>
<td></td>
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<tr>
<td>Renal vascular disease</td>
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<tr>
<td>Dissection</td>
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<tr>
<td>Atherosclerotic</td>
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<tr>
<td>Hyperaldosteronism</td>
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<tr>
<td>Adrenal adenoma</td>
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<tr>
<td>Adrenal hyperplasia</td>
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<tr>
<td>Genetic causes</td>
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<tr>
<td>Liddle syndrome</td>
<td></td>
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<tr>
<td>Gordon syndrome (pseudohypoaldosteronism type II)</td>
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<tr>
<td>Cushing syndrome</td>
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<tr>
<td>Dexamethasone suppressible hyperaldosteronism</td>
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<tr>
<td>Other genetic causes (Hashimoto’s thyroiditis; scleroderma renal crisis)</td>
<td></td>
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<tr>
<td>Miscellaneous causes</td>
<td></td>
</tr>
<tr>
<td>Renin-secreting tumor (juxtaglomerular cell tumor)</td>
<td></td>
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<tr>
<td>Syndrome of apparent mineralocorticoid excess</td>
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<tr>
<td>Coarctation</td>
<td></td>
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<tr>
<td>Vasculitis and arteritis</td>
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<tr>
<td>Tuberous sclerosis</td>
<td></td>
</tr>
</tbody>
</table>
Sleep apnea
Drug-induced
Obstructive uropathy
Renal compression (Page kidney)
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
  (nocturnal hypertension)

### 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 renal disease
Drug-induced

**Renal mass**
- Cystic
- Solid

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

**Nephritic glomerular disorders, vasculitis, and vasculopathy**
- IgA nephropathy and 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**
- 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
- Fibrillary and immunotactoid glomerulonephritis
- Fabry’s disease
- Other disorders (biopsy complication)

**Thin basement membrane nephropathy and Alport’s syndrome**

**Thrombotic microangiopathies**

**Hemolytic uremic syndrome**
- Shiga toxin-mediated hemolytic uremic syndrome
Atypical hemolytic uremic syndrome

Drug-associated atypical hemolytic uremic syndrome
(anticancer drugs, clopidogrel, interferon, quinine)

Other atypical hemolytic uremic syndrome
(pregnancy-associated)

Scleroderma renal disease

<2%

<table>
<thead>
<tr>
<th>Kidney Transplantation</th>
<th>10% of Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-transplantation</strong></td>
<td>&lt;2%</td>
</tr>
</tbody>
</table>

  - Transplant immunology
    - Detection of pre-transplant alloreactivity and
      immunologic evaluation of transplant candidates
  - Desensitization
  - 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

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

Multigorgan and extrarenal transplantation

Ethics, society, and public policy

Pharmacology

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
   2.5%
   Principles and mechanisms of nephrotoxicity
   Antibacterial agents
      Aminoglycosides
      Vancomycin
   Antiviral agents
Antifungal agents
  Amphotericin B
Antiparasitic agents
Additional antimicrobials
Pain medications
  Nonsteroidal anti-inflammatory drugs
  Fentanyl
  Gabapentin
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
Iodinated contrast and other imaging agents
Lithium
Supplements and herbs
  Aristolochic acid
  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)
<table>
<thead>
<tr>
<th>Classification</th>
<th>Percentage</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hemodynamic (prerenal) acute kidney injury</strong></td>
<td>3.5%</td>
<td>True volume depletion&lt;br&gt;Renal&lt;br&gt;Extrarenal&lt;br&gt;Effective volume depletion&lt;br&gt;Heart failure&lt;br&gt;Cirrhosis&lt;br&gt;Nephrotic syndrome</td>
</tr>
<tr>
<td><strong>Drugs</strong></td>
<td></td>
<td>Nonsteroidal anti-inflammatory drugs&lt;br&gt;Calcineurin inhibitors&lt;br&gt;Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers&lt;br&gt;Radiopaque agents&lt;br&gt;Other drugs (anticoagulants; interferon)</td>
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<tr>
<td><strong>Abdominal compartment syndrome</strong></td>
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<tr>
<td><strong>Parenchymal (intrinsic) acute kidney injury</strong></td>
<td>4%</td>
<td>Vascular&lt;br&gt;Systemic diseases and vasculitis&lt;br&gt;Atheroemboli&lt;br&gt;Renal vein thrombosis</td>
</tr>
<tr>
<td><strong>Glomerular</strong></td>
<td></td>
<td>Drug-induced&lt;br&gt;Infectious&lt;br&gt;Other glomerular parenchymal acute kidney injury (relapsed microscopic polyangiitis)</td>
</tr>
<tr>
<td><strong>Tubular</strong></td>
<td></td>
<td>Ischemic&lt;br&gt;Nephrotoxic&lt;br&gt;Systemic disease&lt;br&gt;Interstitial&lt;br&gt;Drugs&lt;br&gt;Systemic disease&lt;br&gt;Malignancy (infiltrative)</td>
</tr>
<tr>
<td><strong>Postrenal acute kidney injury</strong></td>
<td>&lt;2%</td>
<td>Retroperitoneal and ureteral&lt;br&gt;Idiopathic retroperitoneal fibrosis&lt;br&gt;Malignancy&lt;br&gt;Stones and crystals</td>
</tr>
</tbody>
</table>
Bleeding
Bladder, bladder outlet, and benign prostatic hyperplasia

**Renal replacement therapy**

Indications
- Solute accumulation
- Hemodynamic
- Acute kidney injury associated with intoxication
- Tumor lysis syndrome

Techniques
- Intermittent hemodialysis
- Continuous renal replacement therapy

Renal replacement therapy prescription
- Dialysate and replacement fluid
- Anticoagulation

Complications
- Hemodynamic
- Citrate intoxication

Other complications (dialysis disequilibrium syndrome)

**Intensive care unit nephrology**

Hemodynamic measures
Intravenous fluids and volume status
Ethics and palliative care

January, 2017