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>9%</td>
</tr>
<tr>
<td>Calcium, Phosphorus, and Magnesium Disorders and Stones</td>
<td>4%</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>22%</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>11%</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>5%</td>
</tr>
<tr>
<td>Acute Kidney Injury and Intensive Care Unit Nephrology</td>
<td>15%</td>
</tr>
</tbody>
</table>

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.

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.

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>Hyponatremia</td>
<td></td>
</tr>
<tr>
<td>Hypotonic</td>
<td>3%</td>
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<tr>
<td>Syndrome of inappropriate antidiuretic hormone secretion (SIADH)</td>
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<tr>
<td>Hypervolemic</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
    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

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

   Respiratory acidosis
   Respiratory alkalosis

Mixed acid-base disturbances

Potassium disturbances

   Hyperkalemia
      Pseudohyperkalemia
      Transcellular shifts
      Medication-induced
      Genetic abnormalities
      Other tubular disorders (hepatitis-associated)
      Postsurgical
      Other hyperkalemia (peritoneal dialysis)
   Hypokalemia
      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

   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
- Genetic causes

**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  

Kidney function parameters  
- Glomerular filtration rate  
- Proteinuria  
- Other kidney function parameters (glycemic control; biopsy)  

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

Progression of chronic kidney disease  

Chronic kidney disease complications  
- Hypertension  
- Fluid overload  
- Anemia and iron deficiency  
- Hyperkalemia  
- Acidosis  
- Protein-energy wasting  
- Other complications of chronic kidney disease  
  (hyperparathyroidism; hypervitaminosis D; hyperphosphatemia)  

Stage IV and V chronic kidney disease  
- Advanced uremic symptoms  
- Preparation for end-stage renal disease  
- Initiation and discontinuation of maintenance dialysis  
- Other stage IV and V chronic kidney disease  
  (parathyroid hormone monitoring)  

End-stage renal disease  
- 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 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>
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<tr>
<td>Severe hypertension</td>
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<tr>
<td>Resistant hypertension</td>
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<tr>
<td>White coat hypertension</td>
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<tr>
<td>Pseudohypertension</td>
<td></td>
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<tr>
<td>Masked hypertension</td>
<td></td>
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<tr>
<td>Other essential hypertension (stage 2 hypertension; thiazide effect)</td>
<td></td>
</tr>
<tr>
<td><strong>Secondary causes of hypertension</strong></td>
<td>4%</td>
</tr>
<tr>
<td>Pheochromocytoma</td>
<td></td>
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<tr>
<td>Renal vascular disease</td>
<td></td>
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<tr>
<td>Dissection</td>
<td></td>
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<tr>
<td>Atherosclerotic</td>
<td></td>
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<tr>
<td>Hyperaldosteronism</td>
<td></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>
<td></td>
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<tr>
<td>Liddle syndrome</td>
<td></td>
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<tr>
<td>Dexamethasone suppressible hyperaldosteronism</td>
<td></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>
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<tr>
<td>Renin-secreting tumor (juxtaglomerular cell tumor)</td>
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<tr>
<td>Syndrome of apparent mineralocorticoid excess</td>
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<tr>
<td>Coarctation</td>
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<tr>
<td>Vasculitis and arteritis</td>
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</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Tubular, Interstitial, and Cystic Disorders</th>
<th>4% of Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal tubular disorders and Fanconi's syndrome</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Drug-induced</td>
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<tr>
<td>Crystal deposition</td>
<td></td>
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<tr>
<td>Genetic</td>
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<tr>
<td>Tubulointerstitial nephritis</td>
<td>2%</td>
</tr>
<tr>
<td>Acute</td>
<td></td>
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<tr>
<td>Drug-induced</td>
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<tr>
<td>Immune</td>
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<tr>
<td>Infectious</td>
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<tr>
<td>Other acute tubulointerstitial nephritis (multifactorial)</td>
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<tr>
<td>Chronic</td>
<td></td>
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<tr>
<td>Drug-induced</td>
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<tr>
<td>Immune</td>
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<tr>
<td>Granulomatous</td>
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<td>Toxins</td>
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<tr>
<td>Hemoglobinopathy</td>
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<tr>
<td>Urinary tract infection</td>
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<tr>
<td>Other chronic tubulointerstitial nephritis (hypokalemic nephropathy; medullary cystic kidney)</td>
<td></td>
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<tr>
<td>Renal cystic disease</td>
<td>&lt;2%</td>
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<tr>
<td>Autosomal dominant polycystic kidney disease (ADPKD)</td>
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<tr>
<td>Genetics</td>
<td></td>
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<tr>
<td>Renal manifestations</td>
<td></td>
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<tr>
<td>Nonrenal manifestations</td>
<td></td>
</tr>
<tr>
<td>End-stage renal disease</td>
<td></td>
</tr>
<tr>
<td>Drug-induced</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Renal mass</th>
<th>&lt;2%</th>
</tr>
</thead>
</table>

### Glomerular and Vascular Disorders  12% of Exam

#### Nephritic glomerular disorders, vasculitis, and vasculopathy  5%
- 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  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
  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%

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%

<table>
<thead>
<tr>
<th>Pharmacology</th>
<th>5% of Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic pharmacology</strong></td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Pharmacokinetics and other basic concepts</td>
<td></td>
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<tr>
<td>Renal handling of drugs</td>
<td></td>
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<tr>
<td>Principles of dialytic drug removal</td>
<td></td>
</tr>
<tr>
<td><strong>Drug selection in kidney disease</strong></td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
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<tr>
<td>Vancomycin</td>
<td></td>
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<tr>
<td>Aminoglycosides</td>
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<tr>
<td>Other antibiotics (cephalosporins)</td>
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<tr>
<td>Antineoplastic agents</td>
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<tr>
<td>Antiviral agents</td>
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<tr>
<td>Other drug selection in kidney disease (metformin; fentanyl)</td>
<td></td>
</tr>
</tbody>
</table>
Nephrotoxicity of medications

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
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; bisphophonates)

Nephrotoxicity of illicit drugs
  Heroin and other intravenous drugs
  Ecstasy
  Cocaine

Drug-drug interactions and adverse effects other than nephrotoxicity

<2%
### Dialysis and other treatment of toxic substances

- 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

#### Hemodynamic (prerenal) acute kidney injury

- 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

- 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

**Renal replacement therapy**
  4%
  **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**
  2%
  Hemodynamic measures
  Intravenous fluids and volume status
  Ethics and palliative care

January 2021