Module A: Screening for CKD and Initial Assessment

1. Incidental finding of abnormal electrolytes, creatinine, proteinuria, hematuria, newly elevated BP, or peripheral edema

2. Initial assessment for kidney disease (see Sidebars 1 and 2) and non-kidney disease

3. Periodically obtain SCR, eGFR, urinalysis, and spot uACR

4. Does the patient have an urgent or emergent condition? (see Sidebar 3)

5. Yes

   1. Refer to emergency department or manage and stabilize

   2. No

6. No

   1. Assess for other medical cause (exit algorithm)

7. Are these findings new?

   1. Yes

      1. Reassess for AKI/AD (exit to Module B)

      2. No

   2. No

      1. Assess for CKD (exit to Module C)

8. Does patient have evidence of kidney disease? (see Sidebar 2)

9. Yes

   1. Assess for AKI/AD (exit to Module B)

   2. No

10. No

   1. Refer to emergency department or manage and stabilize

   2. Is there evidence of volume depletion, or volume overload? (see Sidebar 5)

   3. Yes

      1. Optimize volume status and reassess or refer to emergency department

      2. No

   4. No

      1. Is there clinical suspicion or evidence for urinary obstruction? (see Sidebar 5)

      2. Yes

         1. Call for urgent nephrology consultation

      2. No

      1. Is there clinical suspicion or evidence for acute nephritis or nephrosis? (see Sidebar 5)

      2. Yes

         1. Reassess renal function and consult nephrology if persistent renal dysfunction (see Sidebar 6)

      2. No

      1. Does patient have an urgent or emergent condition? (see Sidebar 3)

      2. Yes

         1. Refer to emergency department or manage and stabilize

      2. No

      1. History:

         1. Symptoms of volume depletion (lightheadedness, dizziness) or overload (pedal edema, dyspnea)

         2. Cause of volume depletion (diabetes, vomiting, decreased oral intake, liver disease)

         3. Medications and supplements (NSAIDs, diuretics, BP med changes)

         4. Recent illnesses/infections (upper respiratory infection, osteomyelitis)

         5. Urinary changes (hematuria, obstruction)

         6. Rheumatological symptoms

         7. Physical: vital signs, peripheral edema, volume status

         8. Labs: assess for abnormal labs (e.g., electrolytes, creatinine, hematuria, microalbuminuria/proteinuria) and lab trends then repeat labs (as clinically appropriate)

      2. No

      1. Does patient have evidence of kidney disease? (see Sidebar 2)

      2. Yes

         1. Assess for AKI/AD (exit to Module B)

      2. No

      1. History:

         1. DM, hypertension, cardiac disease/congestive heart failure, or vascular disease

         2. Systemic illness (e.g., HIV, systemic lupus erythematosus, multiple myeloma)

         3. Urinary tract abnormalities

         4. History of AKI, proteinuria, or other known kidney disease

         5. Family history of kidney disease (e.g., ADPKD)

         6. Patients age 60 and above

         7. Ethnicities associated with increased risk (e.g., African Americans, Hispanics, Native Americans)

      2. No

      1. Is there evidence of volume depletion, or volume overload? (see Sidebar 5)

      2. Yes

         1. Optimize volume status and reassess or refer to emergency department

         2. No

      1. Is there clinical suspicion or evidence for urinary obstruction? (see Sidebar 5)

      2. Yes

         1. Call for urgent nephrology consultation

      2. No

      1. Stop nephrotoxins, metformin, diuretics, and other drugs (e.g., ACEI/ARBs, antibiotics, aspirin)

      2. Consider trial of hydration

      3. Reassess renal function and consult nephrology if persistent renal dysfunction (see Sidebar 6)

Module B: Evaluation for AKI or New Decline in Renal Function

11. Evaluation for possible AKI/AD or new decline in renal function (see Sidebar 4)

12. Does the patient have an urgent or emergent condition? (see Sidebar 3)

13. Yes

   1. Refer to emergency department or manage and stabilize

   2. No

14. No

   1. Is there evidence of volume depletion, or volume overload? (see Sidebar 5)

   2. Yes

      1. Optimize volume status and reassess or refer to emergency department

      2. No

   3. No

      1. Is there clinical suspicion or evidence for urinary obstruction? (see Sidebar 5)

      2. Yes

         1. Call for urgent nephrology consultation

      2. No

      1. Stop nephrotoxins, metformin, antibiotics, aspirin, etc.

      2. Consider trial of hydration

      3. Reassess renal function and consult nephrology if persistent renal dysfunction (see Sidebar 6)

Module C: Assessment for Kidney Disease

1. History:

   1. Symptoms of volume depletion (lightheadedness, dizziness) or overload (pedal edema, dyspnea)

   2. Cause of volume depletion (diabetes, vomiting, decreased oral intake, liver disease)

   3. Medications and supplements (NSAIDs, diuretics, BP med changes)

   4. Recent illnesses/infections (upper respiratory infection, osteomyelitis)

   5. Urinary changes (hematuria, obstruction)

   6. Rheumatological symptoms

   7. Physical: vital signs, peripheral edema, volume status

   8. Labs: assess for abnormal labs (e.g., electrolytes, creatinine, hematuria, microalbuminuria/proteinuria) and lab trends then repeat labs (as clinically appropriate)

2. Does the patient have an urgent or emergent condition? (see Sidebar 3)

3. Yes

   1. Refer to emergency department or manage and stabilize

   2. No

4. No

   1. Assess for other medical cause (exit algorithm)

5. Are these findings new?

   1. Yes

      1. Reassess for AKI/AD (exit to Module B)

      2. No

   2. No

      1. Assess for CKD (exit to Module C)

6. Does patient have evidence of kidney disease? (see Sidebar 2)

7. Yes

   1. Assess for AKI/AD (exit to Module B)

   2. No

7. No

   1. Refer to emergency department or manage and stabilize

   2. Is there evidence of volume depletion, or volume overload? (see Sidebar 5)

   3. Yes

      1. Optimize volume status and reassess or refer to emergency department

      2. No

   4. No

      1. Is there clinical suspicion or evidence for urinary obstruction? (see Sidebar 5)

      2. Yes

         1. Call for urgent nephrology consultation

      2. No

      1. Stop nephrotoxins, metformin, antibiotics, aspirin, etc.

      2. Consider trial of hydration

      3. Reassess renal function and consult nephrology if persistent renal dysfunction (see Sidebar 6)

Module D: Definition of AKI and AKD

1. Definition of AKI (presence of any of the following):

   1. Increase in SCr of >0.3 mg/dL over not more than 48 hrs

   2. Increase in SCr of >0.5 mg/dL over not more than 48 hrs

   3. Increase in SCr of >0.5 mg/dL over >48 hrs

2. Definition of AKD (presence of any of the following):

   1. GFR <60 mL/min over <3 months

   2. Decrease in GFR by >35% or increase in SCR by >50% for <3 months

   3. Kidney damage (structural) for <3 months

3. For volume depletion, e.g.:

   1. Symptoms of volume depletion (lightheadedness, dizziness)

   2. Fluid administration

4. For suspicion of acute nephritis or nephrosis (hematuria, dysmorphic RBCs or RBC casts, new onset proteinuria) with:

   1. Recent illnesses (e.g., infection)

   2. Constitutional or rheumatologic symptoms

   3. Rash

   4. Edema

   5. Hemolytic-uremic syndrome

5. For volume overload, e.g.:

   1. Symptoms of volume overload (e.g., dyspnea, edema)

   2.利尿治疗

   3. ACEI/ARBs/diuretics, and other drugs (e.g., NSAIDs)

   4. Reassess renal function and consult nephrology if persistent renal dysfunction (see Sidebar 6)

Abbreviations: ACEI: angiotensin-converting enzyme inhibitor; ADPKD: autosomal dominant polycystic kidney disease; AKD: acute kidney disorder; AKI: acute kidney injury; ARB: angiotensin receptor blocker; ASD: atherosclerotic cardiovascular disease; BP: blood pressure; Ca: calcium; CKD: chronic kidney disease; CPG: clinical practice guideline; dL: deciliter; DM: diabetes mellitus; DoD: Department of Defense; eGFR: estimated glomerular filtration rate; GFR: glomerular filtration rate; hr: hour; HTN: hypertension; kg: kilogram; L: liter; mL: milliliter; mEq: milliequivalent; mg: milligram; min: minute; mL: milliliter; mEq/L: mmol/L; NSAID: non-steroidal anti-inflammatory drug; PO: per os; RBC: red blood cell; SCr: serum creatinine; SCR: serum creatinine; uACR: urine albumin-to-creatinine ratio; uPCR: urinary protein-to-creatinine ratio; VA: Department of Veterans Affairs.
Is the patient's eGFR above the threshold for safe contrast administration (see Sidebar 12)?

Yes

No

If the patient's eGFR is >90 mL/min/1.73 m²:

No

Administer IV normal saline at 1 mL/kg/hr for 6-12 hrs post-procedure.

Yes

Administer IV normal saline at 1 mL/kg/hr for 1 hr post-procedure.

Sidebar 11: Considerations for When Studies Requiring Iodinated Contrast are Indicated

- Consider non-contrast studies as alternative
- Use minimum amount of contrast necessary for appropriate testing
- Consider holding metformin due to risk of lactic acidosis (see Recommendation 16 discussion section in the full CPG)

Sidebar 7: Indications for Urology Consultation

- Isolated or gross hematuria
- Renal masses or complex renal cysts
- Symptomatic or obstructing nephrolithiasis
- Hydro nephrosis or bladder abnormalities
- Urinary symptoms (e.g. nocturia, hesitancy, urgency, incontinence)

Sidebar 10: Strategies to Slow Progression of CKD

- Control of hypertension with preferential use of either ACEI or ARB in patients with albuminuria/protinuria
- Individualized control of DM
- Use of SGLT2 inhibitors in patients with type 2 DM and an eGFR > 30 mL/min/1.73 m²
- Eliminate or minimize nephrotoxic agents whenever possible (e.g., NSAIDs, iodinated contrast)
- Refer to dietitian for medical nutrition therapy (e.g., protein intake, sodium restriction, weight loss)

Module C: Evaluation for CKD

Evaluate for CKD (see Sidebar 6)

Consult urology

Consult nephrology

Establish stage of CKD (see Sidebars 9a and 9b) and probable etiology

Monitor and assess for CKD progression and development of complications periodically with BP, SCr/eGFR, uACR or albuminuria, hematuria, or proteinuria

Is consultation with urology indicated? (see Sidebar 7)

Yes

No

Is consultation with nephrology indicated? (see Sidebar 8)

Yes

No

Is there evidence of disease progression or development of indications for nephrology consultation (see Sidebar 8)?

Yes

No

*Referral should be made following shared decision making with patient that ensures the referral is consistent with the patient values and preferences

- Is consultation with nephrology indicated?* (see Sidebar 6)

- Is consultation with urology indicated?* (see Sidebar 7)

- Establish stage of CKD (see Sidebars 9a and 9b) and probable etiology

- Assess risk for progression of CKD (see Table 2 in the full CPG)

- Formulate treatment plan to treat underlying cause

- Assess risk for progression of CKD (see Table 2 in the full CPG)

- Review/update vaccination status

- Adjust medication doses for eGFR

- Formulate treatment plan to treat underlying cause

- Assess risk for progression of CKD (see Table 2 in the full CPG)

- Review/update vaccination status

- Adjust medication doses for eGFR

Module D: Management of Patients with CKD Requiring Iodinated Contrast

-kidney disease

- Kidney transplant

- Metabolic management (prevention) of kidney stone disease

- Electrolyte abnormalities (e.g. hyperkalemia, hyponatremia)

- Renal transplant

- Adenylate kinase (ADPKD)

- Unclear cause of CKD, hematuria, or proteinuria

- Rapid decline of eGFR (>5 mL/min/1.73 m² per year)

- Urinary symptoms (e.g., nocturia, hesitancy, urgency, incontinence)

- Hydronephrosis or bladder abnormalities

- Symptomatic or obstructing nephrolithiasis

- Renal masses or complex renal cysts

- Use of SGLT2 inhibitors in patients with type 2 DM and an eGFR > 30 mL/min/1.73 m²

- Eliminate or minimize nephrotoxic agents whenever possible (e.g., NSAIDs, iodinated contrast)

- Refer to dietitian for medical nutrition therapy (e.g., protein intake, sodium restriction, weight loss)

- Is consultation with urology indicated?* (see Sidebar 7)

- Is consultation with nephrology indicated? (see Sidebar 8)

- Establish stage of CKD (see Sidebars 9a and 9b) and probable etiology

- Assess risk for progression of CKD (see Table 2 in the full CPG)

- Formulate treatment plan to treat underlying cause

- Assess risk for progression of CKD (see Table 2 in the full CPG)

- Review/update vaccination status

- Adjust medication doses for eGFR

- Formulate treatment plan to treat underlying cause

- Assess risk for progression of CKD (see Table 2 in the full CPG)

- Review/update vaccination status

- Adjust medication doses for eGFR

- Kidney damage with normal or increased GFR

- Kidney damage with mildly decreased GFR

- Metyldo to moderately decreased GFR

- Moderately to severely decreased GFR

- Severely decreased GFR

- Kidney failure

- Patient needing a study requiring iodinated contrast (see Sidebar 11)

- Is the patient's eGFR above the threshold for safe contrast administration (see Sidebar 12)?

- Proceed with administration of contrast

- The patient is in decompensated heart failure?

- Is the patient in decompensated heart failure?

- Is the patient in decompensated heart failure?

- Is the patient needing a study requiring iodinated contrast (see Sidebar 11)?

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No

- Yes

- No