2021 | Chronic Kidney Disease: MSHS Ambulatory Care Pathway

Mount Sinai Health Partners

Checklist for Chronic Kidney Disease Management for Front Line Providers

Screening/ Management	Benchmark	Frequency	Next Steps for Uncontrolled/ Positive Findings
Estimate GFR and albuminuria	GFR ≥ 90 Urine ACR <30 mg/g	**Stages 1-2:** Annually **Stage 3:** Semiannual **Stages 4/5:** Quarterly	Determine if progressive Estimate risk for progression (Kidney Failure Risk Equation or KidneyIntelX in diabetics)
Nutrition	**PROTEIN INTAKE:** **Stage 5:** 0.6-0.8 g/kg/d **SODIUM INTAKE:** **Stages 3/4-5:** <4g/<3 g d **Stages 3-5 w Htn:** <2 g/d	Annually and as needed	Provide dietary counseling (Nutritionist or CDE) Protein: 50% High Biologic Value, 50% plant-based
Blood Pressure Control	**Target Blood Pressure:** <130/80	Monthly until controlled, then every 3-6 months	**Lifestyle modification, Home BP monitoring Non-Diabetic:** • ACR <30 mg/g, GFR <60: Use ACE/ARB, CCB, Diuretic • ACR 30-300 mg/g: Use of ACE/ARB suggested • ACR >300 mg/d: Use ACE/ARB **Diabetic:** • ACR<30: Use ACE/ARB, CCB, and/or Diuretic • ACR >30 or GFR<60: Use ACE/ARB
Diabetes Mellitus	HbA1c <7% (range <6.5-8%) Urine ACR <30 mg/g	**Controlled:** q 6 mon **Poorly controlled:** q 3 mon	Intensify medications to optimize control Both metformin and SGLT-2i as first line therapy Use GLP-1 RA if intolerant to SGLT-2i/GFR <30
Lipid Management	LDL <130 or <100 based on ASCVD risk	Annually	Lifestyle modification Statin therapy for Stage 3-5 (Non-Dialysis)
Metabolic Acidosis	Sodium Bicarbonate >22 meq/l	**Stage 1-2:** Annual **Stage 3:** q 6 mon **Stages 4/5:** q 3 mon	If bicarbonate <22 mEq/l, add sodium bicarbonate (650 mg TID) or sodium citrate (30 ml/d)
Anemia	Hgb level ≥13 mg/dl men, ≥12 women	**Stage 3:** Annual **Stages 4-5:** q 3 mon **On ESA:** q 3 mon	Replete iron orally or IV if iron deficient (FeS04 325 mg TID, Fe gluconate 2-3 mg/kg/d BID-TID) Erythropoiesis Stimulating Agents if refractory
Bone Metabolic Disease	Normal Calcium and Phopshate concentrations	**Screening at GFR** <45 **Stage 3b:** q 6-12 mon **Stage 4:** q 3-6 mon **Stage 5:** q 1-3 mon	Correct hypocalcemia if <7.5 mg/dl (adjusted for albumen), symptomatic, or severe hyperPTH Treat hyperphosphatemia with diet (~900 mg/d) and phosphate binders if >6 mg/dl
	Vitamin D	Screening to establish baseline and as needed	Correct as without CKD, if Phosp/calcium normal. Calcitriol or synthetic vitamin D analogs if progressive hyperparathyroidism
	Parathyroid hormone level	**Stage 3B:** Baseline **Stage 4:** q 6-12 mon **Stage 5:** q 3-6 mon	Correct modifiable factors Calcitriol/Vit D analogues for severe progressive disease
Hyperkalemia	Serum Potassium: 3.5-5.2 mmole/l	**Stage 1-2:** Annual **Stage 3:** q 6 mon **Stages 4/5:** q 3 mon	Low potassium diet, Reduce or eliminate contributing meds Correct acidosis Sodium polystyrene, Patiromer, or Sodium zirconium cyclosilicate
Behavioral Health	• PHQ 2/9	Annual Screening	Confirm diagnosis of depression Initiate treatment and/or refer
Immunizations	• PPSV 23	Once if GFR <30 or at higher risk, repeat in 5y	Consider administration of PV 13 at 65 yrs
	• Hepatitis B	Complete Hep B series when GFR <30 and at risk of progression	Check HepBs Ab to confirm immunity
	• Influenza	Annual.	

Chronic Kidney Disease: Staging and Treatment

Diagnosis and Staging

1. **History: Majority of Early Cases are Asymptomatic and Detected Incidentally or through Screening.**
2. **Diagnosis, Staging, and Estimating Prognosis**

- Chronic kidney disease is defined as any abnormality of kidney function or structure lasting >90 days
- CKD should be distinguished from acute kidney injury (2-7 days) and acute kidney disease (<3 months)
- Diagnostic Testing:
  - Estimate GFR using serum creatinine, age, gender (typically on lab report, do not adjust by race)
  - Measure urinary albumin excretion: Urine albumin to creatine ratio (ACR) is preferred test
  - Renal ultrasound typically obtained to assess kidney structure and rule out obstruction

- **Classification — Focus on GFR AND Level of Albuminuria**
  - **Stratify GFR into Stages 1-5, Urine ACR into Stages A1-A3.**
  - Use Table below to classify risk of progression, monitoring frequency, and time interventions
    - Progression defined as drop in GFR category and a 25% decrease from GFR baseline
    - Rapid progression is a decline in GFR of >5 ml/min/1.73m^2 per year
    - If GFR <60, use Kidney Failure Risk Equation to estimate 2 yr and 5 yrs of dialysis or renal transplantation (**https://kidneyfailurerisk.com/**) or KidneyIntelX for diabetics

Persistent Albuminuria Categories

GFR Categories (ml/min/1.73m^2)				A1 Normal-Mildly Increased <30 mg/g	A1 Moderately Increased 30-300 mg/g	A1 Severely Increased >300 mg/g	BMD*	NA Intake**	Diabetes Treatment***		
	Stage 1	Normal or High	≥ 90	1 visit/yr if CKD	1 visit/yr	2 visits/yr		<4 g (<2 g/d if HTN or DM)	Metformin	SGLT-2i	GLP-1 RA
	Stage 2	Mildly Decreased	60-89	1 if CKD	1	2					
	Stage 3a	Mild-Moderately Decreased	45-59	1	2	3					
	Stage 3b	Moderately-Severely Decreased	30-44	2	3	3	Assess for Bone Mineral Disorder				
	Stage 4	Severely Decreased	15-29	3	3	4+		<3 g (<2 g/d if HTN or DM)			
	Stage 5	Kidney Failure	<15	4+	4+	4+					
Hypertension without DM				ACE/ARB, CCB, Diuretic	ACE/ARB Suggested	ACE/ARB					
Hypertension-with DM, GFR>60				ACE, ARB, CCB, Diuretic	ACE/ARB	ACE/ARB					
Hypertension w DM, GFR<60				ACE/ARB							

Risk of progression based on GFR and severity of albuminuria indicated by color (green-very low, yellow-low, orange-moderate, red-high, deep red-very high). Frequency of follow-up based upon GFR and severity of albuminuria (visits per year)

* Bone Mineral Disorder (BMD): Time to initiate monitoring for BMD, based on GFR

** Daily sodium intake based on GFR

*** Appropriate use of SGLT-2, GLP-1 RA, and metformin based on GFR. SGLT-2 preferred. Use GLP-1 RA if SGLT-2 not tolerated or GFR <30

**** Recommended hypertension treatment based on severity of microalbuminuria and presence/absence of DM. Use highest tolerated dose.

Chronic Kidney Disease: Staging and Treatment (continued)

Diet and Lifestyle

Component	CKD status	Recommendation
Protein	**Stage 5** (Possibly Stages 3b-4)	Consider 0.6-0.8 g/kg/d protein (50% high biologic value, 50% plant based) (70 kg pt =70g, ¼ pound of beef/cheese has 28 g protein, ½ cup grain has 3 g)
Salt	**Stages 3-5**	<4 g/d Stage 3, or <3 g/d for Stage 4-5, symptomatic fluid retention/proteinuria, <2g/d if hypertensive or diabetic (1/4 teaspoon salt has 575 g sodium)
Potassium	**Stage 3**	<4.7 grams per day (442 mg per banana, 230 mg in ¼ cup orange juice)
	Stages 4-5	<3 grams per day
Calcium	**Stages 3-5** (Pre-Dialysis)	800-1,000 mg daily (1 calcium carbonate tablet has 500-600 mg elemental Ca)
Fluids	**Stage 3**	Restrict to <1.5 liters per day (approximately six 8 oz glasses of water)
Energy	**All**	30-35 kcal/kg per day
Exercise	**All**	30 minutes a day, five days a week

Delaying Disease Progression

1. **Hypertension** *(see Checklist)*
2. **Diabetes Mellitus** *(see Checklist)*
   - Screening: Annual urine ACR and GFR estimation, start 5 yrs after Dx of DM1, upon dx of DM2
   - Type 2 DM Treatment Recommendations *(see Table)*
     - Target HbA1c: Range 6.5%-8% depending on comorbidities, life expectancy, CKD severity
     - Use SGLT-2 inhibitor with metformin if GFR >30, and UACR ≥30 mg/g, particularly if UACR >300 mg/g
     - Use GLP-2 RA if SGLT-2i contraindicated (GFR <30), not tolerated or 3rd antihyperglycemic needed

Managing Complications

1. **Metabolic Acidosis** *(see Table)*: If HC03 <22 mEq/l: treat with oral bicarbonate to normalize level
2. **Hyperkalemia** *(see Table)*: Severe (K> 6.0—6.5 mEq/l): clinical emergency mandating immediate care
3. **Iron Deficiency Anemia:** Iron supplementation useful in both absolute and functional iron deficiency
4. **Bone Mineral Bone Disorder (CKD BMD)**
   - Hypocalcemia: Supplement calcium if severe, progressive secondary hyperparathyroidism, not if mild.
   - Vitamin D deficiency
     - Calcitriol use limited to progressive hyperparathyroidism (PTH levels 2.5-3X upper limit of nml)
       - Calcitriol 0.25 mg three times a week, if corrected Ca <9.5 and normal phosphate
       - Dose adjusted to keep PTH <150
     - Other synthetic vitamin D agents can be used
   - Hyperphosphatemia
     - Keep serum phosphate toward normal range in non-dialysis CKD pts
       - Limit dietary phosphate to ~900 mg/d (10-12 mg/kg protein/d)
       - Phosphate binders (Non-calcium containing binders preferred)
         - Calcium containing binders: Used for low calcium and high PTH
         - Non-calcium containing binders: Sevelamer/Lanthanum

1. Chen TK, Knicely DH, Grams ME, Chronic Kidney Disease Diagnosis and Management: A Review. *JAMA*. 2019 October 01; 322(13): 1294–1304
2. KDIGO 2020 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease Kidney International Supplements 2020;98:1-120
3. KDIGO 2017 Clinical Practice Guideline Update for the Diagnosis, Evaluation, Prevention, and Treatment of Chronic Kidney Disease–Mineral and Bone Disorder (CKD-MBD) Kidney International Supplements, 2017;7:1-59.

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Managing Common Comorbidities

Cardiovascular Disease

1. **Coronary Artery Disease: Antiplatelet Therapy**
   - Primary Prevention: ASA/other antiplatelet agents may be modestly useful
   - Secondary Prevention: Low dose ASA (81 mg) is preferred to higher doses
2. **Heart Failure: SGLT-2 inhibitors have beneficial effects on HF and CKD, with and without DM**

Lipid Disorders

1. Treatment Recommendations for patients 40-75 yrs old
   - Patients with GFR 15-60 and/or urine ACR >30 mg/g not receiving dialysis or post-transplant with 10 yr ASCD risk ≥7.5% should be treated with a statin +/- ezetimbi
   - GFR >60 and albuminuria or other kidney disease, should receive a statin or have treatment reserved for those with increased ASCVD risk
2. Moderate intensity statin doses recommended (e.g. Atorvastatin 40 mg/d), unless other indications for high dose. Doses of renally excreted statins may need to be reduced.

Chronic Kidney Disease: Clinical Integration Care Delivery Steps

Nephrology Referral Indications

1. Clarify cause of CKD and/or assistance managing related complications, AKI or abrupt sustained fall in GFR.
2. All Stage 4-5 CKD (GFR <30), urine ACR >300 mg/g, KidneyIntelX™ high risk score
3. Resistent hypertension, persistent hyper-/hypokalemia, hyperphosphatemia, anemia warranting ESA
4. Planning for or initiation of dialysis (if risk of kidney failure within next year is ≥10-20%)
5. Transplantation: Should be considered if GFR <20 with likely progressive, irreversible CKD over next 6-12 months

Care Management Referral Indications

1. Multiple no-shows, treatment non-adherence
2. Demonstrated difficulty managing symptoms and/or disease processes
3. Frequent potentially preventable admissions or ED visits
4. Complex family dynamics, difficulty accessing needed community-based care, and/or a high "worry score"
5. **Use MSHP Care Management Referral in Epic, email mshpcmreferral@mountsinai.org, or call 212-241-7228.**

Medications Commonly Used in Chronic Kidney Disease

Medication Class	Generic Name	Trade Name	Dosage Strength/ Product	Starting Dose (no renal/ hepatic dysfunction)	Maximum Daily Dose (s)	Common Side Effects
Vitamin D	Calcitriol	Rocaltrol, Calcijex	0.25-0.5 mcg q day	0.25 mcg	Pre-dialysis: 0.5 mcg/d Dialysis: 1 mcg/d	
Phosphate binders	Calcium carbonate	Tums, Alka-Seltzer Extra Strength	Tablet, capsule, and liquid forms (40% elemental Ca, 200 mg Ca per 500 mg)		2,000-2,500 mg elemental Ca/d	Hypercalcemia, Soft tissue calcification, GI side effects, low turnover bone disease
	Calcium acetate	NA	667 mg cap, liquid (25% elemental Ca 160 mg elemental Ca per 667 mg)	667 mg TID with meals	2,000-2,500 mg elemental Ca/d	
	Sevelemer hydrochloride	Renagel	800 mg	800 mg TID (Phos 5.6-7.4 mg/dl) 1600 mg TID (Phos >7.5 mg/dl	13 g/d (13,000 mg)	Expensive, GI side effects, potential reduced vitamin D and K absorption
	Sevelemer carbonate	Renelva	800 mg tab, 800, 2400 mg pkt		14 g/d (14,000 mg)	
	Lanthanum	Fosrenal	500, 750, 1000 mg (chewable)	500 mg TID	1,500 mg TID	Cost, GI side effects, potential bone accumulation
Hyperkalemia	Sodium polystyrene sulfonate	Sodium polystyrene sulfonate	15 g per 60 ml	Oral: 15 g daily	Oral: 15 g QID	GI side effects, Sodium retention, Low K, Ca, Mg, Decreased absorption of meds, Rarely intestinal necrosis
	Patiromer	Valtessa	8.4 g, 16.8 g, 25.2 g per packet	8.4 g/d	25.2 g q day	Abdominal pain, gas constipation, diarrhea, low Mg
	Sodium zirconium cyclosilicate	Lokelma	5 g, 10 g per pkt	10 g TID for 48 hrs max 10 g/d	15 g q day	Edema, hypokalemia