

Myanmar Multi-Specialty Physicians Global Alliance

mmpga.org

Overview of Chronic Kidney Disease Management

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Interactive session



Overview of Chronic Kidney Disease Management

- Definition
- Causes
- Stages of CKD
- Management of CKD
- Predicted Risk Score (TANGRI)

Serum Creatinine – 2.0 (<1.2)

• AKI?

• CKD?

• AKI on CKD?

Definition of Chronic Kidney Disease

DEFINITION OF CKD

1.1.1: CKD is defined as abnormalities of kidney structure or function, present for >3 months, with implications for health. (*Not Graded*)

	Urine sediment abnormalities Electrolyte and other abnormalities due to tubular disorders Abnormalities detected by histology Structural abnormalities detected by imaging History of kidney transplantation
Decreased GFR	GFR <60 ml/min/1.73 m ² (GFR categories G3a-G5)

Criteria for CKD (either of the following present for >3 months)

Abbreviations: CKD, chronic kidney disease; GFR, glomerular filtration rate.



Causes of CKD



Others include

- 1. ADPKD
- 2. Urologic reflux, stone, UTI
- 3. Hereditary Alport, Fabry
- 4. Loss of renal mass AKI
- 5. Unknown



Evolution of GFR methodologies

BUN,Cr

 Highly insensitive for CKD detection

24 hr-Crcl Overestimation of GFR

Cockcroft-Gault Eq

• Estimates raw CrCl not GFR

GFR

- Validated
- Best Option



<u>Glomerular Filtration Rate</u> – MDRD vs. CKD-EPI

ADULT GFR ESTIMATING EQUATIONS

2009 CKD-EPI creatinine equation: $141 \times \min(SCr/\kappa, 1)^{\alpha} \times \max(SCr/\kappa, 1)^{-1.209} \times 0.993^{Age} [\times 1.018 \text{ if female}] [\times 1.159 \text{ if black}], where SCr is serum creatinine (in mg/dl), <math>\kappa$ is 0.7 for females and 0.9 for males, α is -0.329 for females and -0.411 for males, min is the minimum of SCr/ κ or 1, and max is the maximum of SCr/ κ or 1.

2012 CKD-EPI creatinine-cystatin C equation



Stages of CKD

Stage	Description	GFR (ml/min/1.73 m ₂
1	Kidney damage with normal or \clubsuit GFR	≥90
2	Kidney damage with mild $igstar{}$ GFR	60-89
3	Kidney damage with moderate Ψ GFR	30-59
4	Kidney damage with severe \clubsuit GFR	15-29
5	Kidney failure	< 15 (or dialysis)



Natural History of AKI/CKD

- Injury(AKI/Infection) → Recovery.
- Injury(severe AKI) → Partial recovery →Adaptive hyperfiltration → Progression
- Repeated Injury (Pyelo) → Repeated damage → Progression
- Chronic Injury (GN, lupus) → Progression
- Estimated physiological loss of GFR is 0.5 1.0 ml/min/year
- Multiple factors influences progression.
- Proteinuria predicts outcome.



Prediction of CKD Progression (KDIGO)

			Persistent albuminuria categories Description and range			
Guide to Frequency of Monitoring (number of times per year) by GFR and Albuminuria Category			A1	A2	A3	
			Normal to mildly increased	Moderately increased	Severely increased	
			<30 mg/g <3 mg/mmol	30–300 mg/g 3–30 mg/mmol	>300 mg/g >30mg/mmol	
R categories (ml/min/1.73 m²) Description and range	G1	Normal or high	≥90	1 if CKD	1	2
	G2	Mildly decreased	<mark>60–</mark> 89	1 if CKD	1	2
	G3a	Mildly to moderately decreased	45–59	1	2	3
	G3b	Moderately to severely decreased	30–44	2	3	3
	G4	Severely decreased	15–29	3	3	4+
GF	G5	Kidney failure	<15	4+	4+	4+

GFR and albuminuria grid to reflect the risk of progression by intensity of coloring (green, yellow, orange, red, deep red). The numbers in the boxes are a guide to the frequency of monitoring (number of times per year).



Cardiovascular disease, CKD and Mortality

- Patients with CKD die of cardiovascular disease.
- However, the traditional cardiovascular risk factors such as diabetes, hypertension, smoking, family history, and dyslipidemia do not completely account for the increased CVD mortality in these patients.
- Vascular calcification and mineral bone disease are major risk factors for CVD morbidity and mortality in patients with CKD.

General management of CKD

- Treatment of reversible causes of renal dysfunction
- Treatment of the complications of CKD
- Slowing the progression of CKD
- Preparation for renal replacement therapy



Treatment of reversible causes (if any)

- Prerenal state diuretics
- Renal causes GNs, Cardio-renal, nephrotoxic drugsaminoglycosides, IV contrast, NSAIDs, Oral Phospho Soda, certain Herbal medicines
- Post renal obstruction Renal USG



Treatment of CKD complications

- Volume overload
- Hyperkalemia
- Metabolic acidosis
- Hyperphosphatemia
- Renal Mineral Bone Disease(MBD) Osteopdystrophy
- HTN
- Anemia



Volume overload

- CKD patients are prone to fluid overload
- Recommend dietary sodium restriction (<2 g/day sodium or <5 g/day salt)



Hyperkalemia

• Causes

- ✓ Poor K excretion
- ✓ Hypoaldosteronism (Type IV RTA in DM)
- ✓ use of ACEI and ARB
- ✓ Acidosis

Recommendations

- ✓ Low K diet
- ✓ Loop/Thiazide diuretics
- Sodium Bicarbonate
- Kaexylate (Sodium Polystyrene Sulfonate)



Metabolic Acidosis

- Can lead to excessive loss of Ca and Phos from the bone, decrease albumin synthesis and muscle mass loss.
- Use Na Bicarbonate to keep bicarb greater than 22 mEq/L.



Hyperphosphatemia

- Major issue in CKD. Retention early in CKD
- High PTH (secondary hyperparathyroidism) corrects it initially but at the expense of renal osteodystrophy
- Low phos diet important (800 mg/day).
- Goal is to keep Phos between 2.7-4.6 mg/dl
- Use phosphate binders with diet. (Ca acetate, Sevelamer, CaCO₃, Lanthanum)
- Ca X Phos should be less than 55



Renal osteodystrophy



Renal Osteodystrophy



Renal Osteodystrophy



Treatment of Hyperparathyroidism and Bone Disease

- Low Phos diet. Use binders if necessary. Calcium acetate, Sevelamer. Do not use Mg or Aluminium containing binders
- Use Calcitrol. Adjust according to PTH levels. Avoid hypoparathyroidism.
- Cinacalcet. (Calcimimmetic agent). Used in ESRD pts.



Hypertension

- 80 to 85% have HTN
- Treating HTN WILL slow progression of CKD and prevent CV complication
- Initiate with ACEI or ARB* and diuretics. Try to attain "dry weight".
- Loop diuretics are more effective than Thiazides
- BP Goal 130/80.
- * efferent arteriole dilatation → decreased intraglomerular pressure



Pathophysiology

Nephron

Proximal tubule

Responsible for reabsorption of:

- 70% of filtered volume
- All amino acids, glucose and HCO₃ and filtered protein
- Phosphate (controlled by PTH)

Distal tubule

Responsible for fine control of:

- Sodium (via aldosterone)
- Potassium (via aldosterone)
- Calcium (via PTH)
- Hydrogen ions (aldosterone)

Bowman's capsule

- Thick segment of ascending limb

- Descending limb

Responsible for: - Generation of hypertonic

- medulla (NaCl) + Urea
- Enabling urine to be concentrated

With fewer nephrons, medulla becomes less concentrated and urine flow rate increases

Collecting duct ADH controls:

- Water permeability
- Urea permeability
- Water is reabsorbed because of hyperosmotic gradient

*ADH : antidiuretic hormone **PTH : parathyroid hormone

Each nephron consists of a glomerulus (the filter), a proximal tubule, loop of Henle, distal and cortical collecting tubule and a collecting duct.

Anemia

- Normocytic, normochromic anemia due to decrease erthropoietin production
- Prevalence 5% in CKD3, 44% in CKD4
- Diagnosis Exclude non renal causes, check iron studies, RBC indices, occult blood in stool
- Initiate erythropoietin (50-100 U/kg/week) or darbepoetin (0.45 mcg/kg)
- Keep iron stores adequate FIRST. Ferritin above 100 and TSAT above 20%.
- Target Hgb 10 11 g/dl



Slowing progression of CKD

Parameters	Intervention/target
Diet	 Moderate protein restriction: 0.7-0.8 g/kg/day(GFR<30) Low salt: < 2 g Na/day Low phosphate: 600-800 mmol/day Low K: 40-70 mmol/day
BP Control	• BP < 130/80 mmHg
Proteinuria	• reduce to < 1 gm. Use ACEI/ARB.
Glycemic control	• HbA ₁ C less than 7%
Smoking	Smoking cessation
Uric acid	?
Dyslipidemia	?



<u>Tangri</u>

- Age
- Sex
- GFR
- Urine Albumin:Creatinine Ratio
- Serum Calcium
- Serum Phosphate
- Serum Albumin
- Serum Bicarbonate

ESRD Risk Score

<u>Tangri</u>

- Score (-) 83 to (+) 29
- 2 yr and 5 yr ESRD risks
- Color coded risk levels– green, yellow, red (low, moderate, high)

www.kidneyfailurerisk.com

THE KIDNEY FAILURE RISK EQUATION

Find out your real risk of kidney failure



KIDNEY FAILURE RISK CALCULATOR LEARN MORE ABOUT YOUR KIDNEYS

FACTS & FIGURES OF

CHRONIC KIDNEY DISEASE (CKD)

If you don't have the information required below talk to your doctor.



ABOUT THIS CALCULATOR

The kidney failure risk equations were developed in patients with CKD stages G3-G5 referred to nephrologists in Canada, and have now been validated in more than 700,000 individuals spanning 30 + countries worldwide.

If you don't have the information required below talk to your doctor.



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A more accurate result can be calculated if you have the following information: Albumin, Phosphorous, Bicarbonate and Corrected Calcium. Do you have these details?



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STAGE 3 MODERATE DECREASE IN FUNCTION



Patient risk of progression to kidney failure requiring dialysis or transplant:



Risk thresholds used in health systems include:

- 3-5 % over 5 years for referral to a kidney doctor
- 10 % over 2 years for team based care (Kidney Doctor, Nurse, Dietician, Pharmacist)
- · 20-40 % over 2 years for planning a transplant or fistula

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- · 3-5 % over 5 years for referral to a kidney doctor
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0.69% 2.14%

· 20-40 % over 2 years for planning a transplant or fistula

ESRD

Initiation of RRT (in general)

- GFR < 25 ml/min, preparation for RRT
- GFR < 20 ml/min, refer for Tx eval
- GFR is not the only indicator in determining when to start RRT
- GFR < 15 ml/min, may need RRT for DM pt
- GFR < 12 ml/min for non-DM pt.
- RRT can be started early for uremic symptoms



Recommendations

- Best management of CKD is prevention
- Early recognition of CKD and its potential complications
- Manage underlying etiology effectively
- Achieve BP <130/80
- Use ACEI and ARBs, diuretics. CCD to control BP
- Drop proteinuria less than a gram
- Avoid nephrotoxic drugs
- 2 gm Sodium, o.8 gm/kg/day protein, low K &Phos diet
- Glycemic control HgA1C < 7% if pt is diabetic
- Early referral to a nephrologist and renal dietitian



Summary

- S Smoking cessation, Staging of CKD
- H Hypertension, Hyperkalemia, Hyperphosphatemia, Hyperglycemia,
- A Anemia, Acidosis
- P Protein intake, PTH
- E Edema, Exercise
- U Undo nephrotoxins
- P Preparation for RRT





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•Thank you!

