

CKD and CDM FYI

Dr. Maggie Watt

Mr. H. E.

- 72 year old retired truck driver
- New patient in April 2002
- PMH_x
 - MI 1983
 - Pituitary Tumour 1983 resected and 6/12 XRT
 - Panhypopituitarism (on Cortisone, Levothyroxine & Testosterone replacement)
 - Renal insufficiency following TUPR
 - bilateral ureteral obstruction Oct 2001
 - Thickened bladder wall and outlet obstruction
 - Creat 150 (no GFR reported yet)

Mr. H.E. (cont'd)

- 55 pack year smoker – multiple attempts to quit
- Past alcoholic (quit 1983)
- HTN
- Hypercholesterolemia
- Type 2 DM (dx May 2004)
- Obesity (BMI 39.2)

Mr. H.E. cont'd

- May 2003 – BP 180/110
 - Start Ramipril 2.5 mg daily, titrated to 10 mg over 2/12
 - Cough on ACEI – change to losartan
- Dec 2003 – BP 150/50
 - Add HCTZ
- April 2004
 - Creat 162, GFR 39 (Stable)
 - Enroll in PROMIS (Kidney Care Initiative)

Mr. H.E. cont'd

- May 2004...my chart notes change
 - Review bloodwork (FBS 12.7 = Type 2 DM)
 - “Stage 3 CKD” (GFR 41)
 - Hyper PTH (secondary)
 - Urine ACR elevated (2.67) (normal < 2 males)
 - Plan – Renal U/S, Refer Nephrology
 - New goal for Lipids in view of DM 2 and CKD
 - LDL < 2.5 and TC/HDL < 4

Further Investigations

- Renal ultrasound June 2004
 - Bilateral mild symmetric cortical thinning
 - Left kidney 11.4 cm, right kidney 9.2 cm
 - No hydronephrosis
 - Bladder normal

And then he sees the nephrologist

- Nephrology Consult – October 2004
 - 3 page consult
 - CKD moderate in severity
 - Small vessel renovascular disease
 - Possibly component of macrovascular dz (asymmetric kidney size on u/s)
 - Twice yearly ACR and renal function
 - Follow up 1 year

- Nephro Follow up - November 2005
 - Stable moderate impairment in kidney function
 - Query right renal artery stenosis
- Nuclear renal scan with furosemide (Dec 2005)
 - “asymmetry of kidney function raises possibility of right renal artery stenosis”
- Feb 2006 – acute decline in renal fxn GFR 16
 - Book MRA, possible dialysis, D/C antihypertensives, ASA
 - Renal MRA - March 2006
 - Severe stenosis at origin of right renal artery
 - Nov. 2006 - Angioplasty and Stent placement in Right Renal Artery
 - 70% stenosis
 - Renal function unchanged but felt almost instantly better

Ongoing Management Mr. H.E.

- Q 3/12 Diabetes Check, CKD Check
 - HTN, Sugars, Renal Fxn, Lipids, Self Care, etc.
 - Motivated re: self care
- Stable renal function
- TKR May 2008
- Died 2 days postop of massive UGI Bleed

BC CKD GUIDELINES – Sept 2008

- **Recommendation 1 - Identify populations at high risk :**
 - Diabetes
 - HTN +/- Cardiovascular Disease
 - Family history of kidney disease
 - High risk ethnicity (First Nations, S. Asian, African Descent, Pacific Islanders)
 - (age >60)

BC CKD Guidelines

- Recommendation 2 – Screen Populations at Increased Risk (q1-2 years)
 - Serum creatinine and eGFR
 - Urine ACR
 - Urinalysis – macro and micro
 - (to detect protein, WBC's, RBC's, cellular casts)

eGFR

- Computed from serum creatinine
- Automatically reported by most labs in BC
- **Persistent (>3mos) eGFR < 60 mL/min indicates substantial reduction in kidney function**
- **Patients with eGFR 60-100 with normal u/a and ultrasound do NOT have kidney disease**

eGFR

■ Accuracy of eGFR:

- **Age > 75** years old may **underestimate** true kidney function
 - eGFR 45-60 may reflect normal variation in absence of other conditions
 - **Caution** recommended with meds, dye and risk of acute kidney injury with severe illnesses
- **Age >85** calculation more problematic
 - Risk of progression not known
 - Conservative approach recommended

eGFR

- eGFR calculation also unreliable in:
 - Very large / very small body habitus
 - Specific diets (very high/low protein)
 - Meds that interfere with creatinine excretion
 - Trimethoprim / Sulfamethoxazole
 - Ciprofloxacin
 - Fenofibrate

Urinalysis (Random)

- Significant abnormalities include:
 - Persistent RBC's or WBC's in absence of instrumentation
 - Cellular casts

ACR

■ Albumin / Creatinine Ratio

- Random urine test – no need for 24 hour collection
- Abnormal (CDA Standard)
 - Men $> 2\text{mg}/\text{mmol}$
 - Women $> 2.8 \text{ mg}/\text{mmol}$
- on **2 out of 3** serial tests – between 1 week and 2 months apart (i.e. persistent)
- Indicates **micro-vascular disease +/- glomerular disease**

PROTEINURIA - Definitions

■ MICROALBUMINURIA

- 24 hour urinary albumin excretion 30 - 300 mg
- Urine ACR
 - < 2.0 mg/mmol (M)
 - < 2.8 mg/mmol (F)
 - Sustained (ie. 2/3 samples)

■ PROTEINURIA (“overt”)

- 24 hour urine protein excretion > 150 mg/day
- Transient, orthostatic, or persistent

■ NEPHROTIC RANGE PROTEINURIA

- > 3 grams/day
- Typically associated with glomerular disease

Recommendation 3 – Evaluate patients with sustained impairments

- eGFR < 60 mL/min for > 3mos
- Evidence of **Kidney Damage**
 - “Pathologic abnormalities or markers of damage, including abnormalities in **blood** or **urine** tests, or **imaging** studies”

Recommendation 3 – Evaluate patients with sustained impairments

- Determine Stage of CKD based upon:
 - eGFR
 - Urinalysis
 - ACR
- See guidelines for National Kidney Foundation (US) Staging system

TIPS ON EARLY DIAGNOSIS OF KIDNEY DISEASE

Who's at risk?

Patients with:

- diabetes;
- hypertension (with or without cardiovascular disease);
- a family history of kidney disease; and
- belonging to specific high-risk ethnic groups (First Nations, Asian, South Asian, Hispanic, African American and Pacific Islanders).

How can I confirm my diagnosis?

- Measure blood pressure (hypertension is common).
- Measure serum creatinine levels and estimated GFR.
- Do a urinalysis to detect protein, white or red cells.
- Measure electrolytes.
- Check hemoglobin levels.

*Produced by the BC Provincial Renal Agency, the Kidney Foundation of Canada (BC Branch) and the Ministry of Health Services.
For more information, contact the BCPRA: 604-806-8845,
bcpa@cheos.ubc.ca or www.bcrenalagency.ca.*



BC Renal Agency
An agency of the Provincial Health Services Authority

STAGES OF REDUCED KIDNEY FUNCTION

Stage	Description	eGFR (mL/min)
1	Kidney damage with normal or \uparrow GFR (but urine test abnormalities)	≥ 90
2	Kidney damage with mild \downarrow GFR	60-89
3	Moderate \downarrow GFR	30-59
4	Severe \downarrow GFR	15-29
5	Kidney failure	<15 or dialysis

The CKD Clinical Practice Guideline provides recommendations for identification, evaluation and management of patients with chronic kidney disease. Copies are available through www.healthservices.gov.bc.ca/cdm or by calling 250-952-1347.

Symptoms of CKD

- Foamy / bloody urine
- Headaches
- Nocturia
- Edema (eyes, ankles)
- Fatigue
- Nausea
- Restless legs
- Anorexia
- Polyuria
- Pruritus

Complications of Reduced GFR

- Anemia
- Hypertension
- Decreased Calcium absorption
- Dyslipidemia
- Heart Failure
- Volume Overload
- Hyperkalemia
- Hyperparathyroidism
- Hyperphosphatemia
- LVH
- Metabolic Acidosis
- Malnutrition (late)

Recommendation 4

Determine Cause of CKD

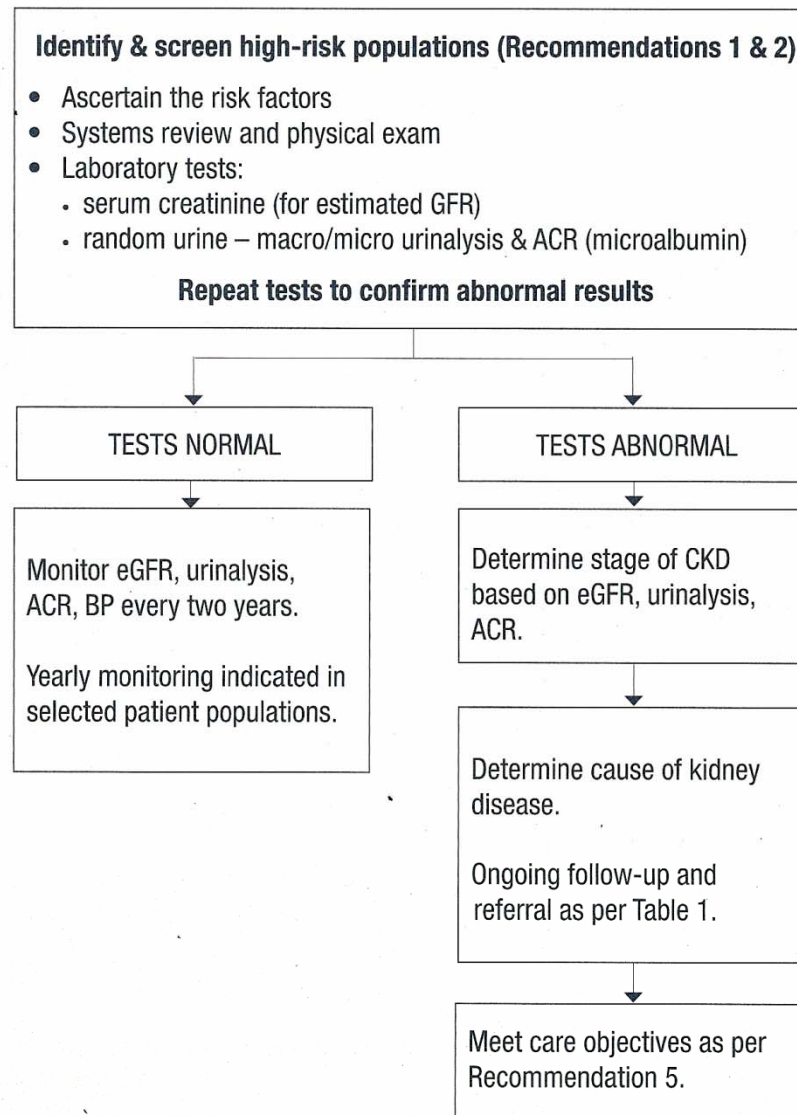
- Impaired kidney function often multifactorial
- Renal ultrasound
 - Polycystic Kidney Disease
 - Stones
 - Cancer
 - Obstruction
 - Discrepant size Kidneys (? Renal artery stenosis)

Causes of CKD

- Diabetes (Type 1 and Type 2)*
- Hypertension*
- Other vascular diseases
 - Large vessel disease, microangiopathy
- Glomerular diseases:
 - Autoimmune, systemic infection, drugs, neoplasia
- Tubulointerstitial Disiases
 - UTI, stones, obstruction, drug toxicity
- Polycystic Kidney Disease

(*account for 2/3 of CKD and ESRD)

Figure 1. Evaluation and Management of Suspected Kidney Disease



WHEN TO REFER

- Sustained decline in GFR $< 30\text{mL/min}$
- Acute renal failure
- Subacute decline in kidney function
 - $>10\text{ mL/min}$ annually
- Sustained proteinuria $> 1\text{gram}/24\text{ hrs}$
- Active urine sediment
 - Cellular casts, sustained hematuria &/or proteinuria

DEFINITIONS / CLARIFICATION

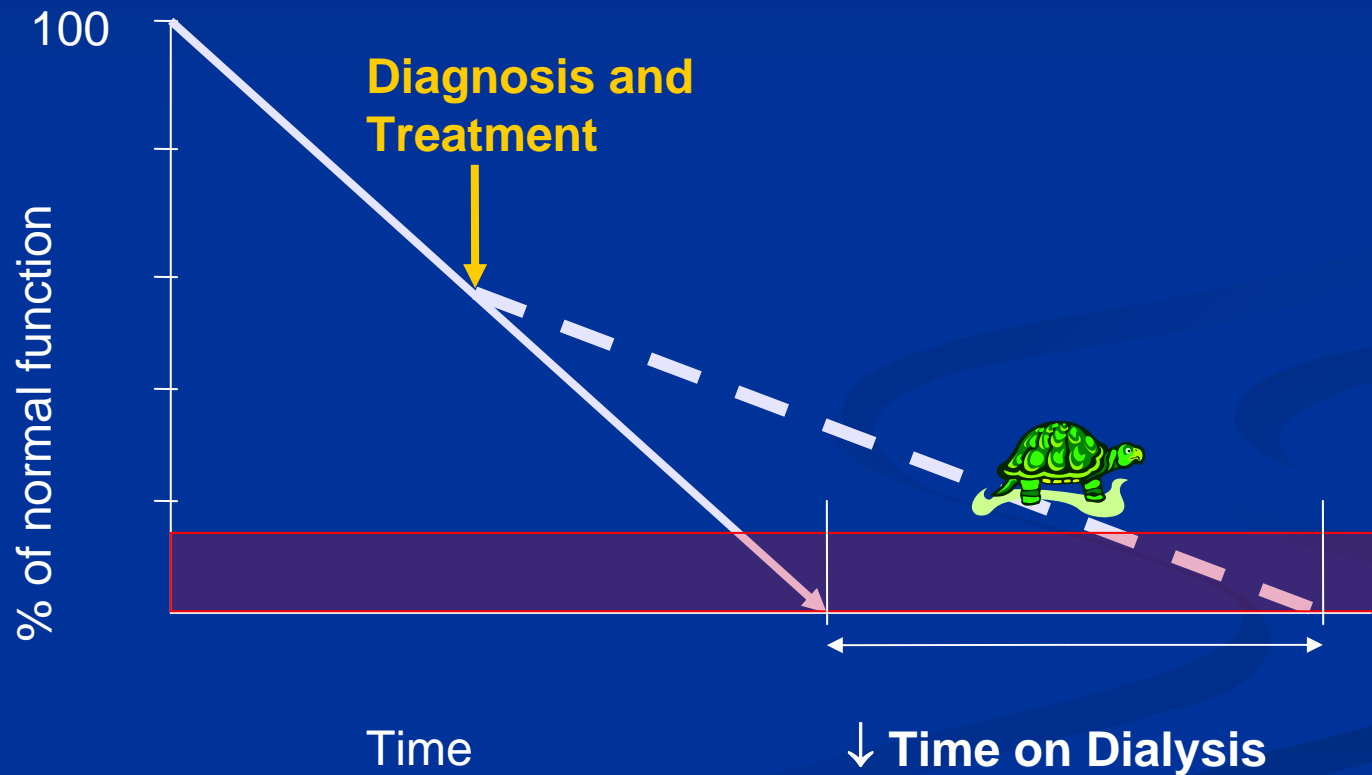
- Certain kidney diseases often require specific management:
 - Glomerulonephritis
 - Obstructive uropathy
 - Acute interstitial nephritis
 - Renal artery stenosis
- Non-disease specific therapies aimed at slowing progressive nephropathy, regardless of:
 - Disease etiology
 - Stage of CKD

A BRIEF REVIEW – CKD

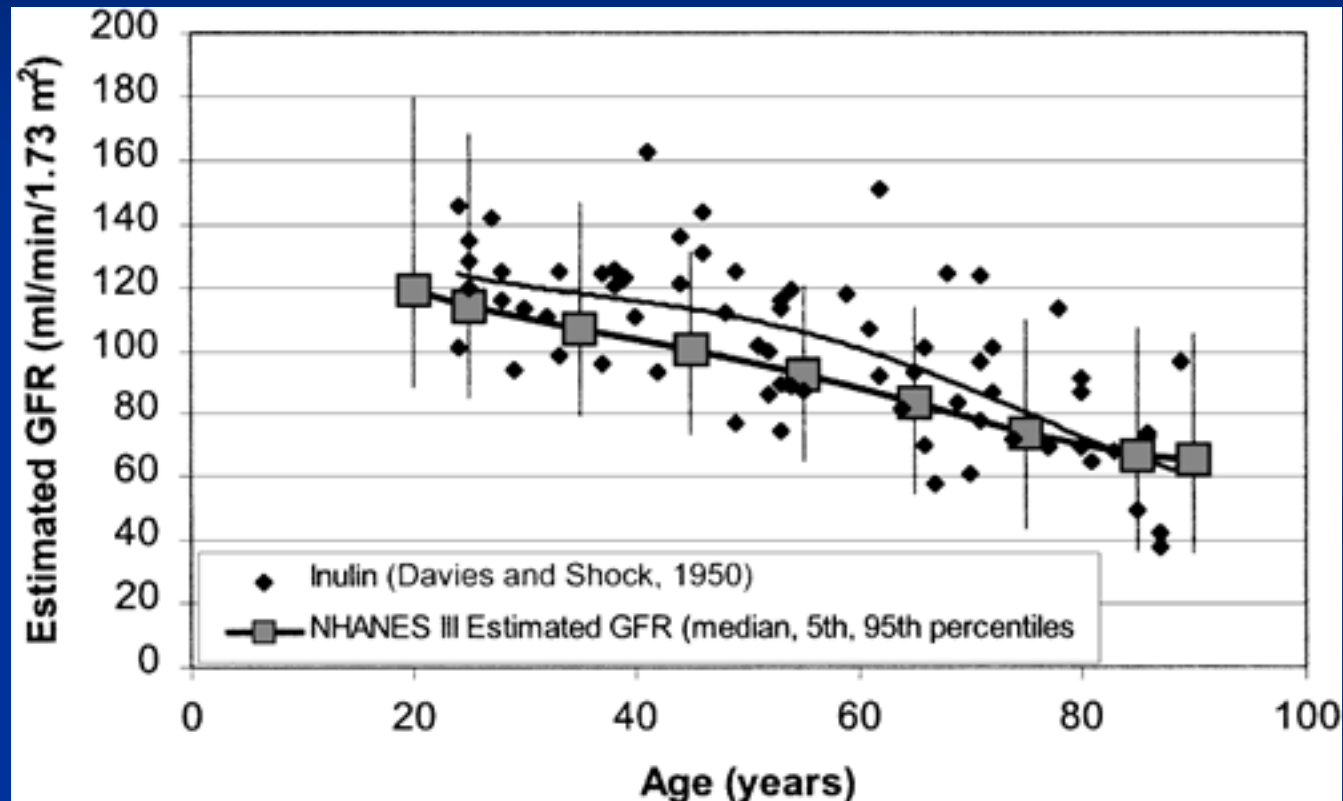
Treatment

- Consider reversible factors
- Avoid nephrotoxins
 - NSAIDs, contrast, aminoglycosides
- Slow CKD progression:
 - BP <130/80 (or 125/75 if proteinuria >1 gram/day)
 - Consider ACEi or ARB therapy
 - Control BG in diabetics (HgA1c <7%)
 - +/- dyslipidemia therapy
 - +/- dietary protein restriction
- Follow CHEP, CDA, CCS guidelines for secondary cardiovascular prevention

END-STAGE KIDNEY DISEASE CAN BE PREVENTED (OR SLOWED)



GFR DECLINES WITH AGE



Normal decline 1 % per year

IMPLICATIONS

- Patients need information on CVD / mortality risk not just progressive nephropathy
- Patients with progressive disease need info on preparation for RRT
- Older patients may benefit less than younger from intensive therapeutic efforts
- Male patients may require more aggressive evaluation, treatment, follow-up, and earlier referral
- More predictors of progressive CKD required

PROTEINURIA - SUMMARY

- Proteinuria is significant when
 - Sustained (>3mos)
 - High-grade
 - Always warrants nephrology referral
- Treatment
 - Lower BP (ACEi or ARB first line)!
 - Treat diabetes to target
 - Attend to other CV risk factors

ANEMIA - SUMMARY

- Increasing prevalence with reduced kidney function
- Transferrin Saturation better gauge of iron stores than Ferritin at low GFR
- Prescribe erythropoietin therapy (Nephrology)
 - After other causes of anemia ruled out
 - After iron stores replete
- Monitor response to therapy monthly
 - Therapy usually well tolerated but watch for HTN with rapid increases in Hgb
- Maintain target hemoglobin 110-130 – increased mortality outside that range

Bone Mineral Metabolism

Objectives for Stage 3 CKD

■ Disease State :

- Hyperphosphatemia
- Hypocalcemia
- Decreased Calcitriol (activated Vit D)
- all increase PTH

Treatment sequence

(Not a medical emergency)

1. Dietary Phosphate restriction
(target normal PO_4 level)
 2. Calcium-based binders with meals
(target normal Ca and PO_4 levels)
 - Start TUMS 1 tab with each meal (decrease PO_4 and increase Ca^{2+})
 3. Alpha Calcidiol (if $\text{PTH} > 7.7 \text{ pmol / L}$)
 - One-alpha 0.25 mg daily
- Monitor labs q 6 mos in treatment phase

Hyper PTH in CKD

- Need to target progressively higher PTH to maintain normal bone turnover as CKD progresses
- Caused by skeletal resistance to PTH

CKD Stage	GFR	Target PTH*
3	30-60	3.8-7.7
4	15-29	7.7 - 12
5	< 15 (dialysis)	16.5 - 33

* opinion based levels

SUMMARY – MINERAL METABOLISM

- Measure Ca / PO₄ / PTH (and albumin) at least yearly
- Restrict dietary PO₄ intake
- When hyperphosphatemia occurs:
 - Reinforce dietary PO₄ restriction
 - start PO₄ binders (typically Ca-based)
- Maintain normal serum Ca levels
- Rx Vitamin D if hypocalcemic or if PTH above target



CHRONIC KIDNEY DISEASE COLLABORATIVE FLOW SHEET/ ENCOUNTER FORM

♦ = MANDATORY FIELDS

♦ PATIENT NAME		♦ PHN # (OR OTHER UNIQUE PATIENT ID)		♦ DATE OF VISIT (DD-MMM-YYYY)	
♦ BIRTHDATE (DD-MMM-YYYY)	♦ GENDER <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE	♦ PHONE (INCLUDE AREA CODE)		CHART NUMBER	
PRACTICE TEAM ID		♦ PROVIDER ID (MSP PRACTITIONER NUMBER / NAME)			
CO-MORBID CONDITIONS <input type="checkbox"/> ALCOHOL OVERUSE <input type="checkbox"/> COR. ART. DISEASE <input type="checkbox"/> LIPID ABNORMALITY <input type="checkbox"/> PERIPH. VASC. DISEASE <input type="checkbox"/> DIABETES <input type="checkbox"/> ARTHRITIS <input type="checkbox"/> CARDIOMYOPATHY <input type="checkbox"/> LIVER <input type="checkbox"/> SMOKING <input type="checkbox"/> KIDNEY <input type="checkbox"/> ASTHMA <input type="checkbox"/> COPD <input type="checkbox"/> OBESITY <input type="checkbox"/> SUBSTANCE ABUSE <input type="checkbox"/> DEPRESSION <input type="checkbox"/> ATRIAL FIBRILLATION <input type="checkbox"/> HYPERTENSION <input type="checkbox"/> OTHER RHYTHM PROBLEM <input type="checkbox"/> VALVULAR HD <input type="checkbox"/> CONGESTIVE HEART FAILURE					
♦ DIAGNOSIS: TYPE OF KIDNEY DISEASE <input type="checkbox"/> DIABETES <input type="checkbox"/> HYPERTENSION <input type="checkbox"/> POLYCYSTIC KD <input type="checkbox"/> OTHER					DATE OF DIAGNOSIS (DD-MMM-YYYY)

PATIENT ENCOUNTERS, DIAGNOSTIC/CLINICAL DATA, BY DATE

✓ = RECALL

REVIEW		MOST RECENT DATA			NEW DATA
PHYSIOLOGY	BP <130/80 - Every Visit				ENTER VALUE /
	Weight BMI (stable) 18.5-24.9 - Every Visit				<input type="checkbox"/> LBS <input type="checkbox"/> FT IN <input type="checkbox"/> KG <input type="checkbox"/> CM - or - BMI:
KIDNEY FUNCTION	sCr & eGFR (stable) - At Least 6 Months				ENTER VALUE
	ACR ≥50%Reduction from Baseline - At Least 6 Months	Neg			ENTER VALUE OR <input type="checkbox"/> POS <input type="checkbox"/> NEG
SUGAR	A1C <0.7 - Every 3 Months				ENTER VALUE
LIPID PROFILE	LDL <2.5 - At Least Annually				ENTER VALUE
	Ratio <4.0 - At Least Annually				ENTER VALUE
ANEMIA	Hgb >120 - At Least Annually				ENTER VALUE
	TSAT >20% - At Least Annually				ENTER VALUE
MINERAL METABOLISM	Calcium >2.2 - At Least Annually				ENTER VALUE
	Phosphorus <1.4 - At Least Annually iPTH & Albumin in Normal Range - At Least Annually				ENTER VALUE
REMINDERS	More Kidney-Specific Education?				<input type="checkbox"/> REVIEWED
	Regular Blood Work Schedule Established?				<input type="checkbox"/> COMPLETED
	Referred to a Nephrology Team?				<input type="checkbox"/> REVIEWED
	Regular Visits Established?				<input type="checkbox"/> COMPLETED
IMUNIZATION	Date of Last Influenza Vaccine				DATE (DD-MMM-YYYY)
	Date of Last Pneumonia Vaccine				DATE (DD-MMM-YYYY)
	Date of Last Hepatitis B Vaccine				DATE (DD-MMM-YYYY)

COMMENTS

How has Toolkit/CDM been useful

- Learn and follow guidelines
- Planned follow-up
 - need to develop recall system
- CDM visits are MY agenda
- Office visits more organized / less harried
- “Shared care” with nephrologist
- ease of billing