Chronic Kidney Disease (Prevention)

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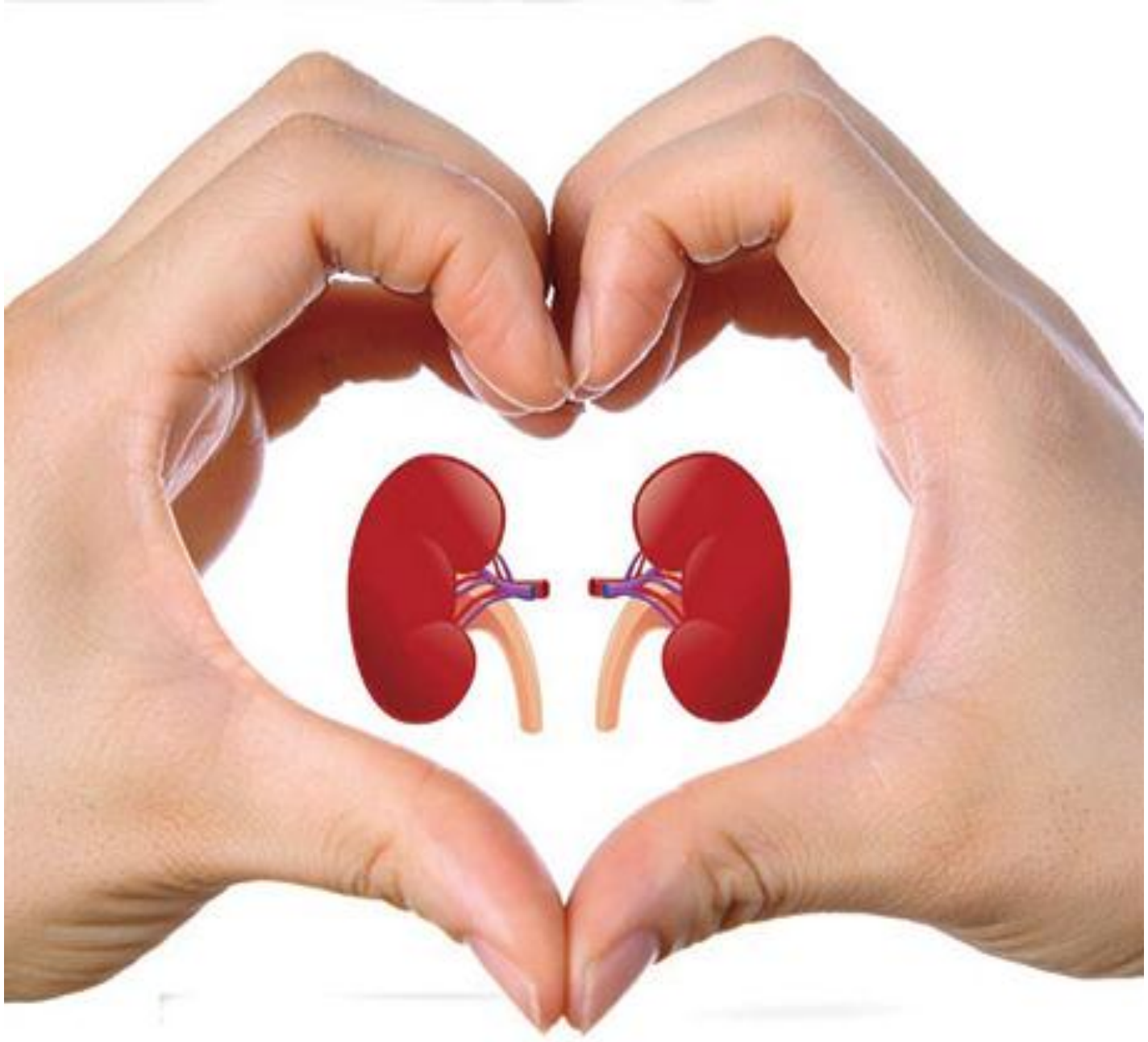
PREVENTION OF CKD

WHY?



Chronic Kidney disease

- **A worldwide public health problem with adverse outcome of**

  Kidney failure and premature death.
- **Kidney disease often has no symptoms, and can go undetected until very advanced.**
- **early detection and treatment can slow or prevent the progression of kidney disease.**
- **an independent risk factor for cardiovascular disease**
- **16 to 40 times more likely to die with kidney failure from complications such as a heart attack or stroke.**

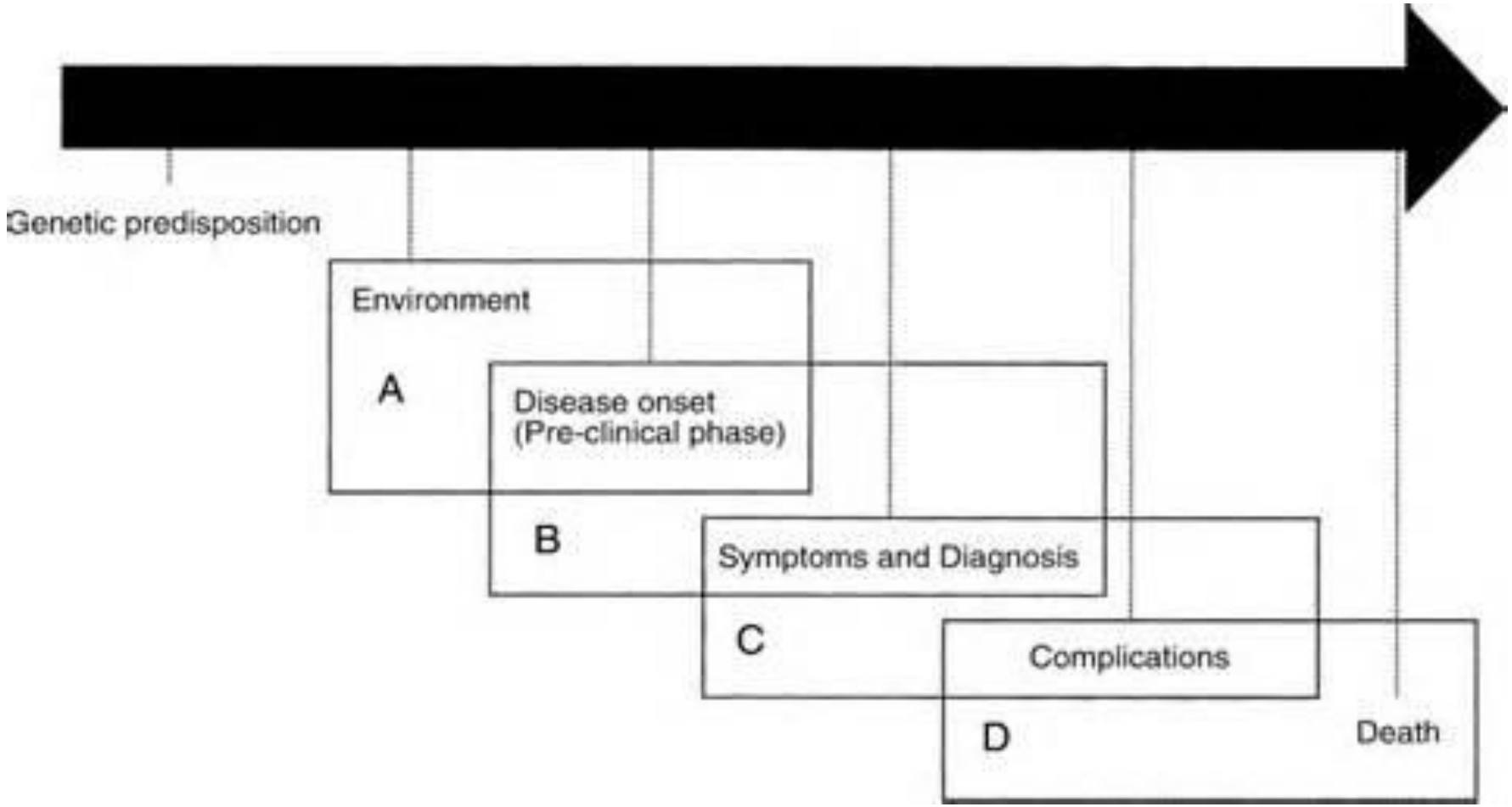
The strategies to promote kidney health

- **to prevent and control risk factors for CKD,**
- **to raise awareness,**

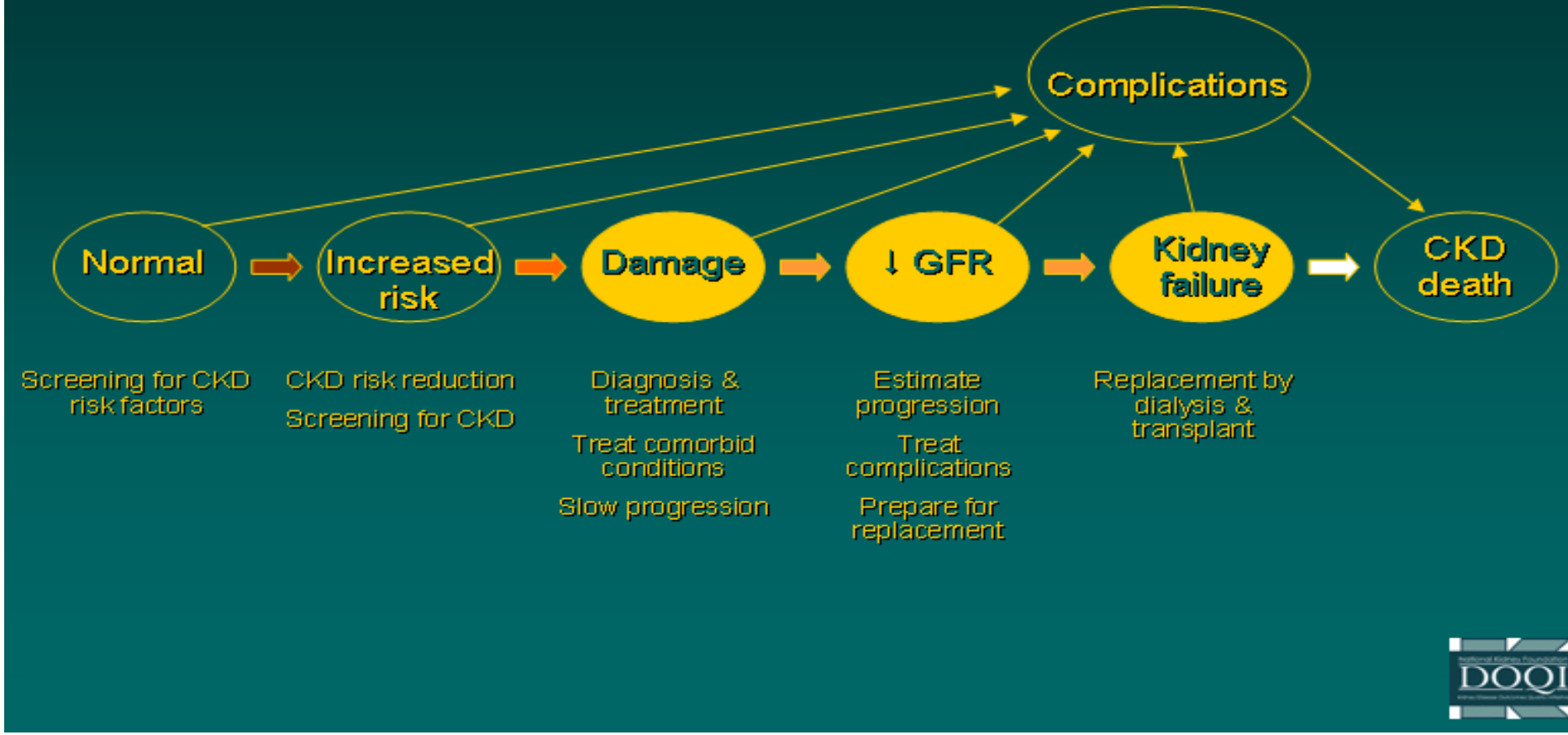
- to promote early diagnosis, and
- to improve outcomes and quality of life for those living with CKD.

- **What is CKD prevention?**
- **What are the RISK FACTORS for CKD?**
- **What are the strategies to prevent CKD?**

Natural History



Stages in Progression of CKD and Therapeutic Strategies



AJKD 2002:39(2)

Prevention of CKD

Primordial prevention

- Prevention of development of risk factors when they have not yet appeared.

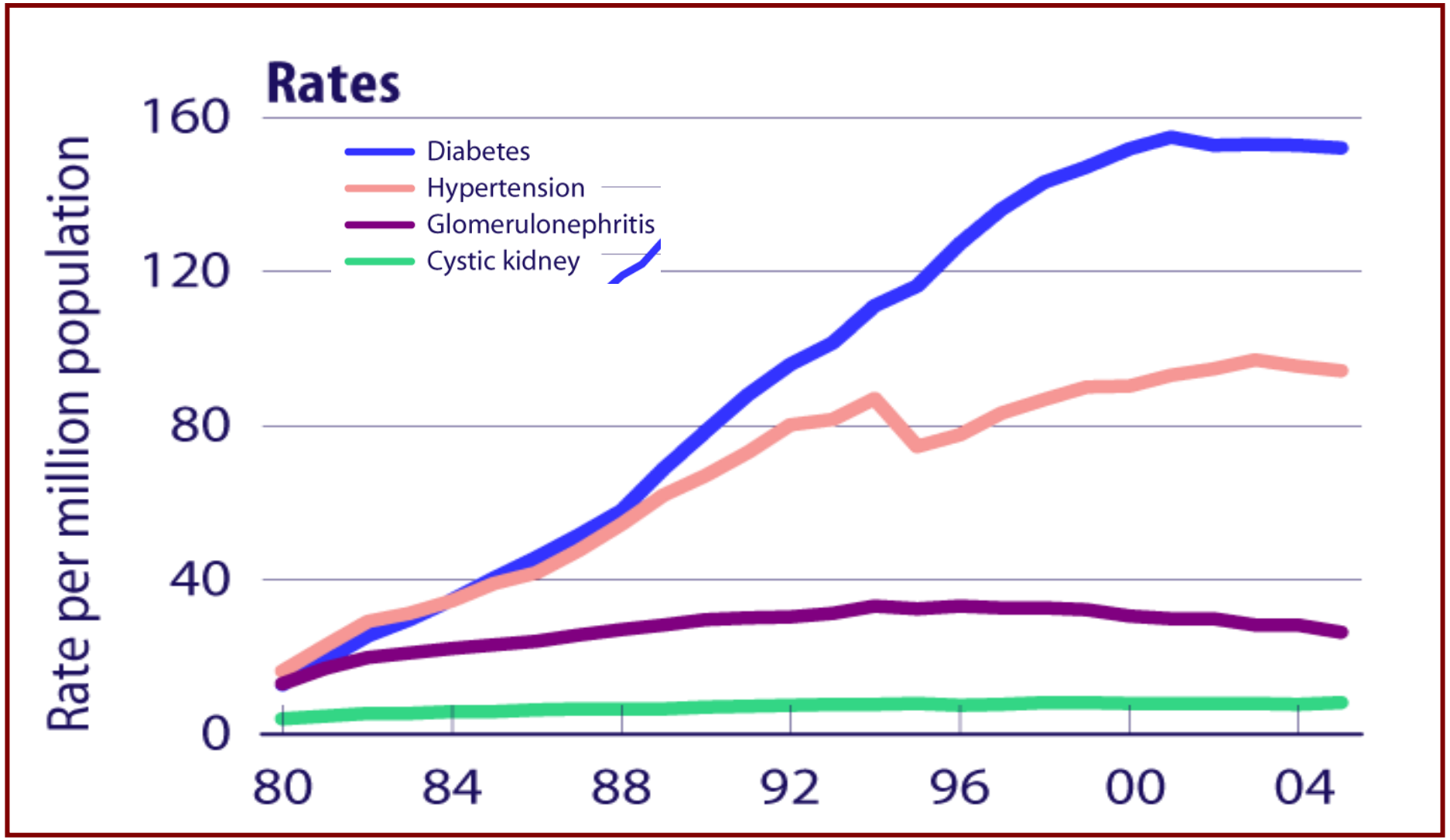
Definition

- **a normal serum creatinine,**
- **eGFR above 60 /minute and**
- **absence of urinary albumin, protein or hematuria**

Causes of CKD

- Diabetes mellitus
- Hypertension/atherosclerotic
- Glomerulonephritis
- Cystic or congenital disorder
- Infective or obstructive
- Miscellaneous
- unknown

Diabetes and hypertension are leading causes of kidney failure



CKD Risk Factors

Modifiable

- Diabetes
- Hypertension
- History of AKI
- Frequent NSAID use

Non-Modifiable

- Family history of kidney disease, diabetes, or hypertension
- Age 60 or older (GFR declines normally with age)
- Race/U.S. ethnic minority status

Additional risk factors(NKF)

- 60 years old,
- racial or ethnic minorities,
- Family history of kidney disease,

- **exposure to known nephrotoxins,**
- **low income or education level,**
- **autoimmune diseases,**
- **systemic infections, urinary tract infections,**
- **nephrolithiasis, neoplasia,**
- **recovery from acute renal failure,**
- **reduction in kidney mass, and low birth weight.**

Population at high Risk

- Elderly
- Obese
- DM
- HT
- Those with family H/O of CKD
- Those with autoimmune disorders
- H/O UTI

Age 60 and old

- **Kidney disease affects 4 in every 10 people over age 65.**
- **The kidneys begin to get smaller as people get older.**

Diabetes Mellitus

- most common cause of CKD
- Type1& type2 DM
- independent risk factor for nephropathy.
- The pathophysiology is complex
- Both hemodynamic and glucose-dependent factors; the accumulation of advanced glycated products, endothelial dysfunction, and loss of intraglomerular blood pressure regulation.

Table 1. Clinical stages of diabetic nephropathy[3]

Stage	GFR	UAE	Blood pressure	Years
1. Hyperfiltration	Super normal	<30 mg/day	Normal	0 - 5
2. Microalbuminuria	High normal - normal	30 - 300 mg/day	Rising	5 - 15
3. Overt proteinuria	Normal - decreasing	>300 mg/day	Elevated	10 - 20
4. Progressive nephropathy	Decreasing	Increasing	Elevated	15 - 25
5. ESKD	<15 mL/min	Massive	Elevated	20 - 30

ESKD = end-stage renal disease; GFR = glomerular filtration rate; UAE = urinary albumin excretion.

Prevention strategies

- Primary Prevention
  - Prevent diabetes through reduction of modifi
    risk factors in general population
- Secondary Prevention
  - Screening those at high-risk for diabetes
- Tertiary Prevention
  - Upon diagnosis of diabetes, prevention of complications morbidity, and mortality

REF: Diabetes Blueprint

Prediabetes

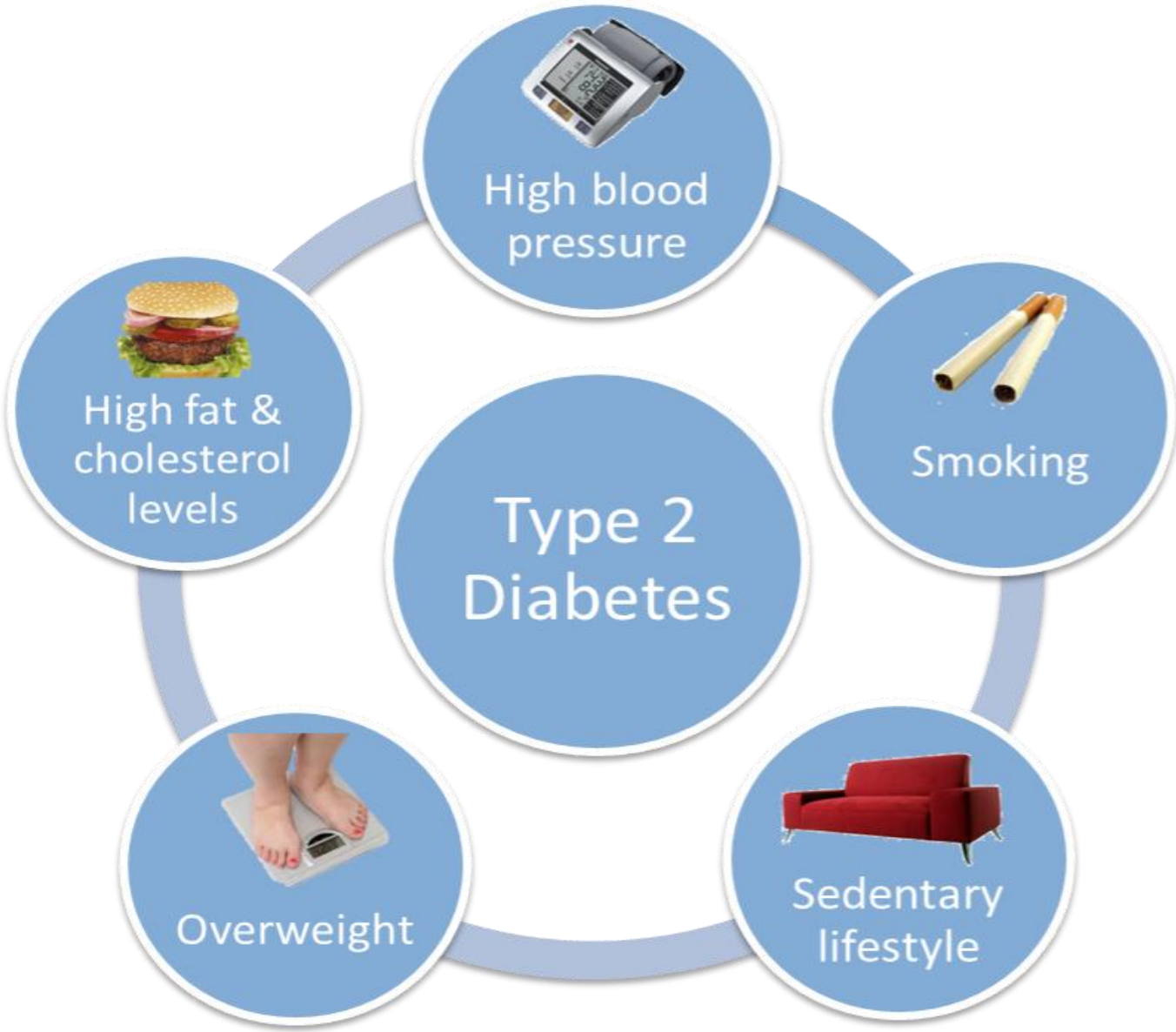
- blood sugar levels are higher than normal,
  but not high enough yet to be diagnosed as diabetes.
- Prediabetes increased risk of developing type 2 diabetes, heart disease, and stroke.
- Prediabetes affects 86 million or 37% of the U.S. adult population (ages 20+, 2009-2012).

To detect **at high risk for diabetes**

- Healthy people who did not report diagnosed diabetes and
- Fasting glucose ≥100 and <126 mg/dLor
- HbA1c value ≥5.7% and <6.5%.

Source: Centers for Disease Control and Prevention. National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014. Atlanta, GA: US Department of Health and Human Services; 2014.

Diabetes Mellitus



Management of DM

- glycemic control reduces the progression of kidney disease.
- The evidence is stronger for T1DM.
- **T1DM**: in the DCCT trial, intensive treatment was associated with less microalbuminuria and decreased progression to macro albuminuria. In addition, the EDIC/DCCT follow-up study cohort has suggested lowering HbA1c preserves GFR in the long term.
- **T2DM**: in the UKPDS study, intensive treatment led to a decrease incidence of microalbuminuria, and other studies have shown reduced progression to macro albuminuria. UKPDS also demonstrated a reduced decline in GFR.
- ADA recommends - A1C concentration below **7 percent.**

  - Yearly screening for **microalbuminuria**

  - BP control with an ACEI or ARB

- KDOQI recommend- HbA1c at <7%.
- However, suggest a target between 7–8% in higher risk patients later in the course of their disease.

High BP

- The second leading cause of ESRD
- Direct damage to small blood vessels in the nephron.
- The kidneys lose their ability to autoregulate glomerular filtration flow and pressure, with resultant hyperfiltration manifesting as **albuminuria and proteinuria**.
- When the proximal convoluted tubule reabsorbs the excess protein, secretion of vasoactive substances further damages the glomerular-tubular apparatus.
- Nephron damage activates the renin-angiotensin-aldosterone system, resulting in increased sympathetic tone and fluid overload, which compound the progression of hypertension and nephron loss.

Hypertension

- High level of BP predict greater development of renal disease.

- **High normal blood pressure**
  (130 to 139/90 or 140/85 to 89 mmHg) - increase in relative risk for ESRD .

- Maintaining BP at < 140/90 - reduce but not eliminate ESKD

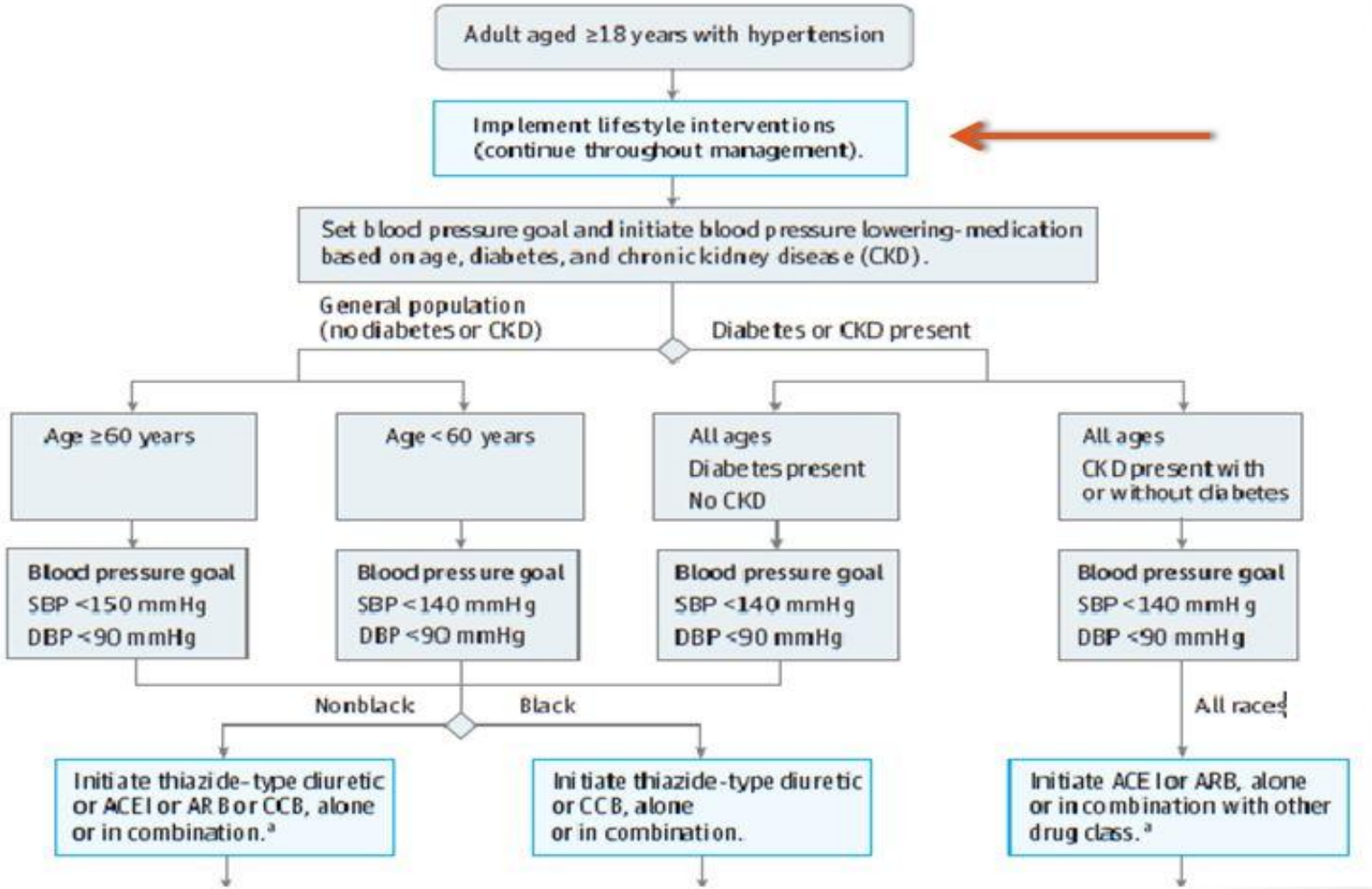
Blood Pressure Target

CARI guideline

Standard BP targets **< 140/90** - as this reduce mortality and morbidity outcomes. (1A)

The seventh JNC report - a target BP **<130/80** mm Hg in patient with chronic kidney disease.

JNC 8: Treatment Algorithm



Blood pressure targets in CKD

KDIGO

- a BP target <140/90mmHg for non-diabetic, nonproteinuric CKD patients.
- Target <130/80mmHg if proteinuria (>30mg/24h) whether diabetic or not.
- Tailor treatment for elderly patients by carefully considering age, co-morbidities and other therapies. Escalate treatment carefully under appropriate supervision.
- BP target less than 110/75mmHg is associated slower rate of annual increase in kidney size and urine protein excretion rate in early cases of APKD(HALT-PKD)

Blood pressure targets in CKD

UK Renal Association and NICE

Without proteinuria (uPCR <100mg/mmol or uACR <70mg/mmol)

- Target 140/90mmHg (SBP 120–139mmHg and DBP <90mmHg).

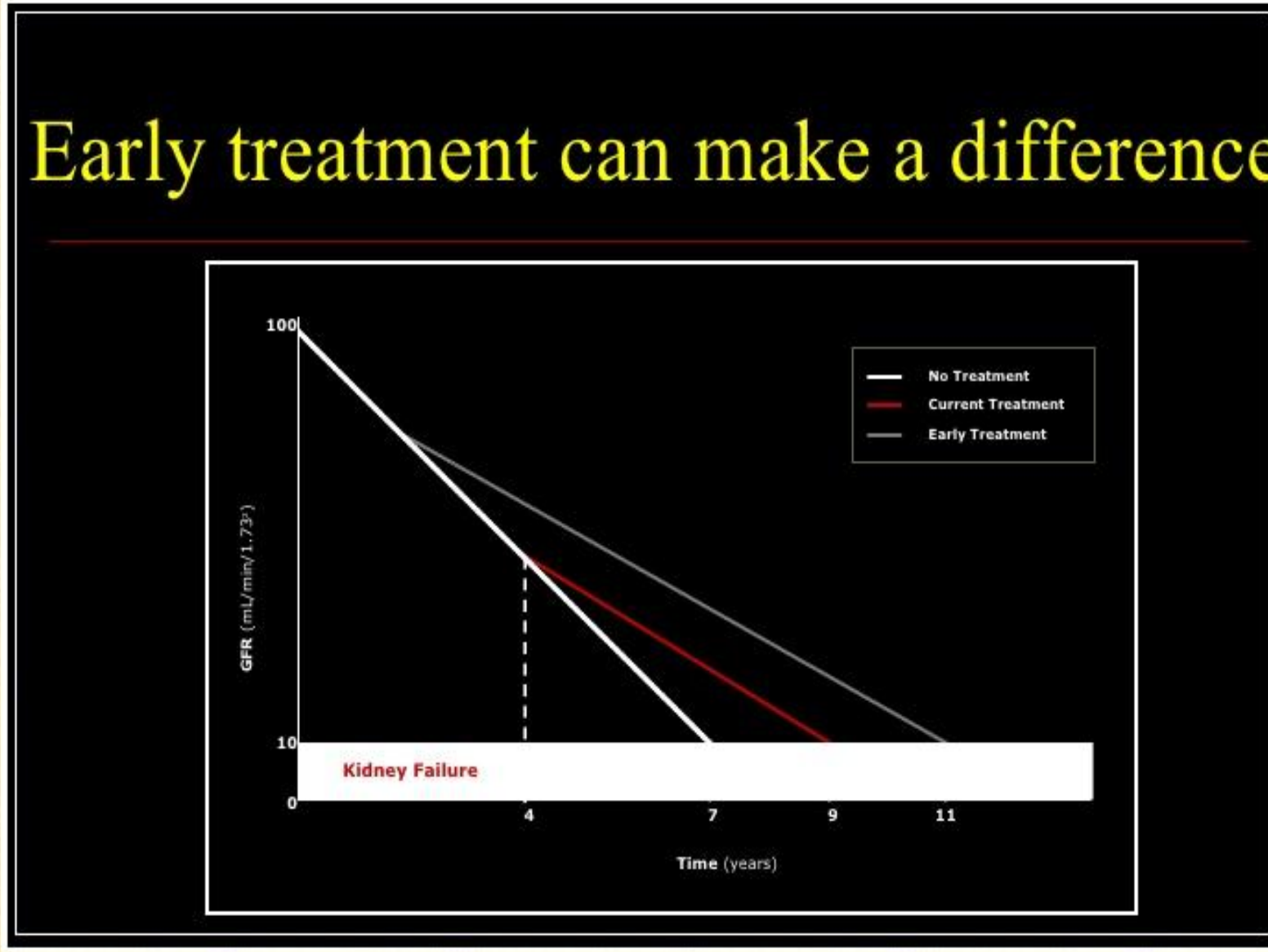
With proteinuria (uPCR >100mg/mmol or uACR >70mg/mmol)

- Target 130/80mmHg (SBP 120–129mmHg and DBP <80mmHg)

Diabetes mellitus:

- Target 130/80mmHg

Early treatment can prevent ESKD



DYSLIPIDEMIA

ARIC study

An association bet dyslipidemia and ESKD.

The NKF K/DOQI recommend

- To treat dyslipidemia aggressively in patients with CKD

- LDL below 100 mg per dL (2.60 mmol per L) and

- A triglyceride below 200 mg per dL (2.26 mmol per L).

How to screen

Identifying risk factors and prevent these risk factors

Simple tests to identify the risk factors

- **Blood pressure measurement**
- **Blood test** to measure waste removal
- **Urine test** to measure waste removal (can be done by a dipstick or more complete urinalysis)

Minimal screening for kidney damage

Assessment of GFR

eGFR -calculated from formulae that adjust SCr for age, sex, and race.

MDRD(The Modification of Diet in Renal Disease) equation

- most widely used since it appeared the most reliable and reproducible in individual patients.

CKD-EPI equation

- a more accurate assessment of GFR in individuals with normal or only slightly decreased GFR.

Normal GFR is 100mL/min/1.73m

Proteinuria

Why is proteinuria so important?

- A marker of chronic kidney damage
- Has prognostic value in progression of CKD
- May itself cause progression of CKD
- A helpful surrogate treatment target
- An independent CV risk factor

Proteinuria

Microalbuminuria

- Screening for presence of **microalbuminuria** is the more sensitive test for detection of early kidney damage.
- **Microalbuminuria is considered positive when the level is 30 mg/g**

- When the glomerular membrane is damaged, the initial protein that is spilled into the urine is albumin because of its molecular size and negative charge.

Approximate equivalent value for proteinuria quantification

uACR(mg/mmol)	uPCR(mg/mmol)	Urinary protein excretion(g/24hour)
30	50	0.5
70	100	1

Screening for microalbuminuria

- **type I diabetes -**after at least 5 year and then yearly thereafter.

- **type 2 diabetes -** at the first diagnosis of their disease and yearly thereafter.

- These guidelines are sensible because 20% to 30% of people with diabetes eventually suffer from ESRD

- **Hypertensive patients-** Periodic, perhaps every 3 year so long as the test remains normal, measurement of serum creatinine and a test for macroalbuminuric by standard dipstick methodology may be appropriate

Uric acid

- Association between high serum uric acid and progression of CKD
- Especially in stage1and stage2.
- Hyperuricemia is independent risk factor for CKD progression in children and adolescents.
- Treatment of CKD with eGFR40+/−11 with allopurinol100mg/day was ass with significant decrease in renal events; dialysis, doubling of serum Cr.

lifestyle changes

- Eat a well-balanced, low-salt diet
- Limit alcohol
- Enjoy regular physical activity
- Manage stress
- Maintain a healthy weight
- Quit smoking

Smoking

- A strong risk factor for CV mortality
- strongly associated with the progression of nephropathy.
- smoking cessation can reduce the progression of CKD in 30 percent of patients with type 1 diabetes.
- Higher incidence of ESKD in smokers in MRFT study
- **Smoking cessation** should be strongly encouraged at each office visit.
- should be offered nicotine-replacement therapies (e.g., patch, gum) and the antidepressant bupropion (Zyban).

Maintain a healthy Weight

Overweight (BMI 25–29.9 kg/m2) &

Obesity (BMI ≥30 kg/m2) - independent risk factors for several chronic disease conditions including coronary heart disease, hypertension, elevated cholesterol, and diabetes. The prevalence of these conditions increases as BMI increases.

- BMI between **20-25 kg/m^2**

Reduced-Calorie TLC Diet for Weight Loss

- Weight loss occurs when calories expended exceed calories consumed.
- this is achieved by reducing caloric intake while increasing daily physical activity levels.
- **Any reduced-calorie diet plan**
- provides the appropriate balance of nutrients at the lower calorie levels.
- The TLC diet low in saturated fats, dietary cholesterol, and sodium, while emphasizing adequate levels of monounsaturated and polyunsaturated fats. These nutrient levels remain constant at the reduced calorie levels, making it a high quality/balanced diet for weight reduction.

Limiting sodium intake to <2,300 mg per day.

An observational study from the Trials of Hypertension Prevention (TOHP) found that

- A 25% to 35% reduction in dietary salt intake reduced the risk of cardiovascular disease (defined as myocardial infarction, stroke, revascularization, or cardiovascular death) by 25% compared to those with no sodium reduction.

Diet

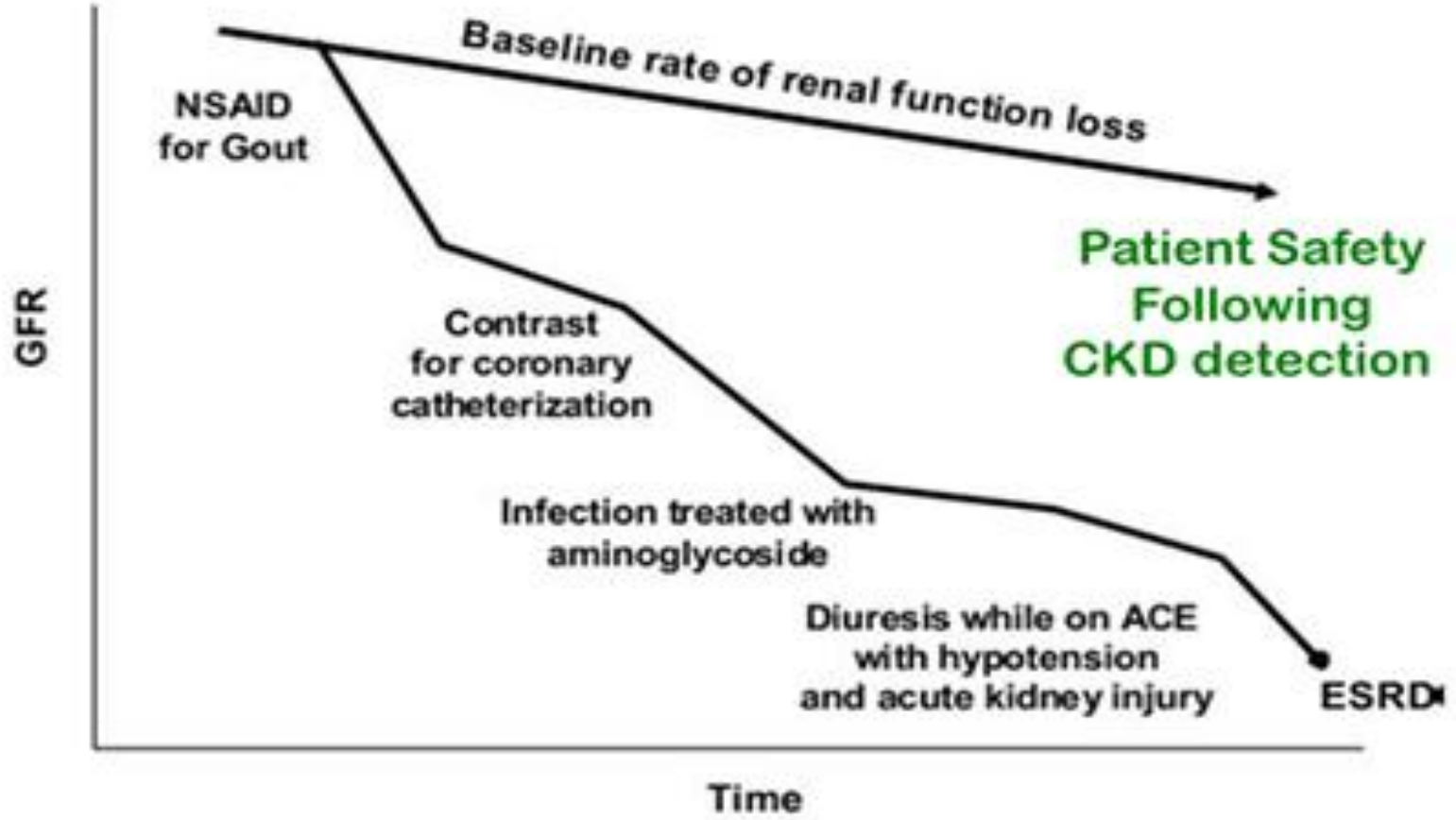
Eating a diet low in protein and fat

- The effect of dietary protein restriction on kidney disease is the subject of debate.
- The MDRD study evaluated three levels of dietary protein intake and found that
- a very-low-protein diet (0.28 g per kg per day) slightly decreased the rate of progression of proteinuria compared with diets with higher protein intake (0.56 g per kg per day and 1.3 g per kg per day).
- The very-low-protein diet did not result in malnutrition, but it also did not decrease progression to kidney failure or death.

- Avoid long-term use of medicines that can damage the kidneys,

  such as pain relievers called NSAIDs and certain antibiotics.

Impact of primary care CKD detection with a patient safety approach



Improved diagnosis creates opportunity for strategic preservation of kidney function

National Kidney Foundation®

Fink et al. *Am J Kidney Dis.* 2009;53:681-668

REFERRAL TO SPECIALIST SERVICES

People with CKD in the following circumstances

- AKI or abrupt sustained fall in GFR; GFR< 30ml/min/1.73 m2 (GFR categories G4-G5)*;
- A consistent finding of significant albuminuria (ACR 300mg/g [>30mg/mmol] or AER >300mg/ 24 hours, approximately equivalent to PCR >500mg/g [50mg/mmol] or PER> 500mg/24 hours);
- Progression of CKD
- urinary red cell casts, RBC 20 per high power field sustained and not readily explained;
- CKD and hypertension refractory to treatment with 4 or more antihypertensive agents;
- persistent abnormalities of serum potassium;
- recurrent or extensive nephrolithiasis;
- hereditary kidney disease.

Awareness of CKD

CKD awareness

- particularly important for persons who exhibit clinical markers possibly directly resulting from their renal dysfunction, because they would benefit from lifestyle and medical interventions to enhance well-being

- **Individual awareness**
- **Provider awareness**
- Provider understanding and recognition of CKD,
- quality of provider-patient communication, and
- frequency of patient visits with the same health care provider are likely determinants of patient understanding of CKD and would help early recognition of CKD

CKD awareness

“Chronic Kidney Disease Awareness Among Individuals with Clinical Markers of Kidney dysfunction"

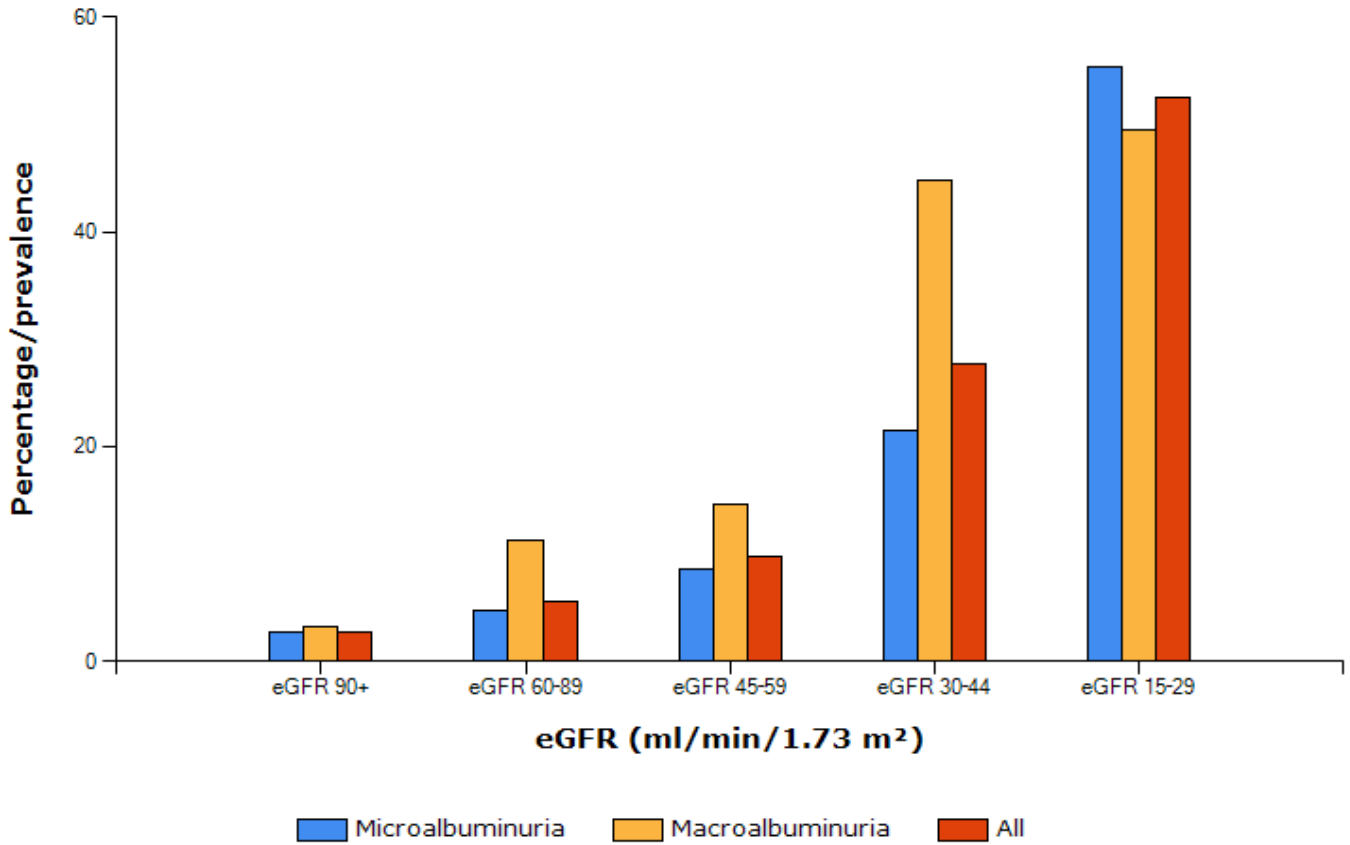
Delphine S. Tuot,*† Laura C. Plantinga,†‡ Chi-yuan Hsu,*† Regina Jordan,§ Nilka Ríos Burrows,§ Elizabeth Hedgeman, Jerry Yee,¶ Rajiv Saran, and Neil R. Powe,†‡ for the Centers for Disease Control Chronic Kidney Disease Surveillance Team

CKD awareness

- Despite the positive association between an increasing number of CKD clinical markers and individual awareness of CKD, awareness of CKD among participants was very low .
- Nearly 90% of individuals with two to four markers of kidney disease were unaware of their renal dysfunction, and
- Among those with at least five markers of kidney disease, 84% were unaware.
- These results remained consistent across all NHANES study periods.

Percentage with Albuminuria or eGFR > 15 Who Were Aware of Their Disease by eGFR and Albuminuria 1999–2014

National Health and Nutrition Examination Survey



Centers for Disease Control and Prevention. Chronic Kidney Disease Surveillance System—United States. website. http://nccd.cdc.gov/CKD.

Increasing public awareness

Educational efforts to increase CKD awareness among the general public, such as formation of the National Kidney Disease Education Program

- Improving the understanding, detection, and management of kidney disease.

- Educational programs should further emphasize other clinical manifestations of CKD as markers of advanced kidney disease, irrespective of eGFR.

World Kidney Day Activities

World Kidney Day Themes

2006 “Are your Kidneys okay"

2011 “Protect your kidney; save your Heart"

2014 " Increasing awareness of chronic kidney disease and aging “

2017 “Kidney Disease &Obesity“

“ Healthy life style for Healthy Kidney"

March is **National Kidney Month**

Get to know your hard working kidneys

6 WAYS KIDNEYS KEEP YOU HEALTHY

- Regulate **fluid** levels
- Activate Vitamin D for healthy bones
- Filter wastes from the blood
- Directs production of red blood cells
- Regulate blood pressure
- Keep blood minerals in balance

8 PROBLEMS KIDNEY DISEASE CAN CAUSE

- Cardiovascular disease
- Heart attack
- Stroke
- Anemia/ low red blood cell count
- Nerve damage
- Weak bones
- High blood pressure
- Kidney Failure

4 RISK FACTORS

- Diabetes
- High blood pressure
- Age 60+
- Family history

7 SYMPTOMS

- Swelling: face, hands, abdomen, ankles, feet
- Blood in urine Foamy urine
- **Puffy** eyes
- **Difficult,** painful urination
- Increased thirst
- Fatigue

2 TESTS YOU CAN TAKE (BLOOD AND URINE)

Urine albumin-to-creatinine ratio estimates the amount of a type of protein, albumin, that you excrete in your urine.

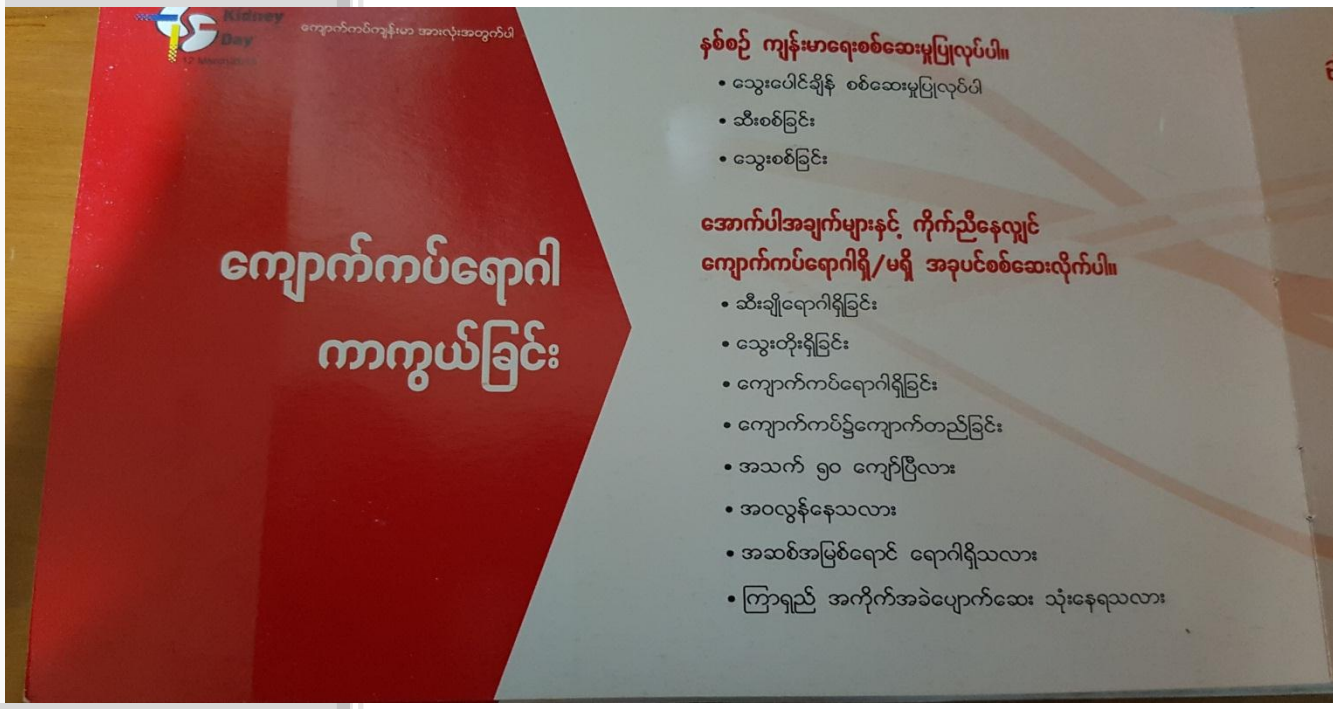
Glomerular Filtration Rate (GFR) tells how well your kidneys are working to remove wastes from your blood. It is the best way to check kidney function. Doctors measure blood creatinine (waste build up) levels and perform a calculation based on race, age

National Kidney

World Kidney Day™

WORLD KIDNEY DAY 2015

KIDNEY HEALTH FOR ALL



Golden rules for Kidney health

- Keep regular control of your blood sugar.
- Keep fit and active
- Eat healthy and keep your weight in check.
- Water, water, water!
- No Smoking!
- Stay away from over-the-counter medicine for chronic issues.

Summary

- Prevention of CKD is important
- Identify those at risk
- CKD Awareness
- Therapeutic lifestyle changes

Thank You

CKD patients

- **Who don’t smoke,**
- **physically active,**
- **eat a healthy diet**

  (more fruits, vegetables and whole grains and less red meat and sugar)
- **BMI between 20-25 kg/m^2,**
- **reduced their risk of death by 68% compared to those who did not have these lifestyle qualities.**