“Start at the beginning: Educating the Educators: What is the CKD Problem?”

What Patient Educators need to know about current trends in

Chronic Kidney Disease

Lajos Zsom, M.D.

Renal Update 2010

What Patient Educators need to know about Chronic Kidney Disease (CKD): Essentials

- Definition: define CKD understanding related controversies including pitfalls of using estimated Glomerular Filtration Rate (eGFR)
- Scope of the problem: link to public health trends and the significance of CKD
- Mechanism of disease: the importance of lifestyle and the Metabolic Syndrome
- Progression of disease: risk factors, predictors of progression
- Patient education: understanding special needs of the patient with kidney disease
- Illustration of concepts: local study and examples from the CKD clinic

Definition of Chronic Kidney Disease

Definition of:

Chronic Kidney Disease =**GFR<60 ml/min/1.73 m^2 or persistent albuminuria***

*American Journal of Kidney Diseases Vol 41, No 1, 2003: pp1-12

Proteinuria versus eGFR

Proteinuria:

- Easy to measure
- Requires spot urine sample
- Predicts renal decline independent of underlying disease process
- Predicts subsequent cardiovascular events
- Often does not correlate with other manifestation of kidney disease with the exception of: volume status and anemia
- Very common in the Metabolic syndrome with exception of: Obstructive Sleep Apnea, Ischemic Nephropathy

eGFR:

- Easy to measure but underestimates renal function in patients without CKD
- Calculated from a simple blood test
- Predicts renal decline in progressive renal disease (CKD may not be progressive)
- Predicts subsequent cardiac events
- Often does not correlate with other manifestation of kidney disease (volume, BP, potassium, anemia, inflammation)
- Common in Metabolic Syndrome with or without proteinuria present

CHRONIC RENAL INSUFFICIENCY: GFR TIMELINE

NKF Stage	DESCRIPTION	GFR ml/min/ 1.73 m^2	COMPLICATION	PREVALENCE (adults> 20yrs)
↑ risk	At risk: DM, HTN AfrAm; Native Am	**≥ 90**	Microproteinuria; HTN; hyperglycemia	>20 million (> 12%)
	Early renal damage	≥ 90	proteinuria, hematuria HTN; progression	>5.9 million (3.3%)
	Mild renal insufficiency	60-89	Proteinuria/hematuria; HTN; progression	>5.3 million (3%)
	Moderate renal insufficiency	30-59	Metabolic acidosis; anemia; hyperparathyroidism	>7.7 million (4.3%)
	Severe renal insufficiency	15-29	Metabolic acidosis; anemia; hyperparathyroidism; fluid balance; potassium	0.4 million (0.2%)
	ESRD	< 15	Metabolic acidosis; anemia; hyperparathyroidism; fluid balance; potassium + Uremia	0.4 million (0.1%) **Many have already died**

Proteinuria versus eGFR: CAVEATS!

- Proteinuria may be false positive in the presence of urinary tract infection, hematuria (Foley specimen) or after exercise.
- eGFR equation is based on study with a study population of moderate CKD; it may be low in healthy patients without CKD or falsely high in patients with advanced renal disease (bilateral nephrectomy with eGFR of 20)
- eGFR usually studied in a cross-sectional manner: it may not correlate with disease progression in an individual patient- many patients with low GFR are stable for years so far as blood pressure, proteinuria, volume and underlying disease (diabetes, hypertension, lupus etc) are under control
- eGFR does not necessarily correlate with other manifestation of renal disease in an individual patient: importance of comorbidity (CHF and salt retention, ADPKD and anemia) and control of underlying disease
- Main pitfalls of CKD: labels healthy patients with disease; ignores underlying disease process; selects out disease measures that may not correlate with global disease burden

Scope of the problem: CKD in Epidemic proportions

Third National Health and Nutrition Examination Survey:

-19.2 million have Chronic Kidney Disease (11%)
-7.6 million have Stage III Chronic Kidney Disease (4.3%)
-0.7 million have Stage IV and End Stage Renal Disease (0.4%)

American Journal of Kidney Diseases
Vol 41, No 1, 2003: pp1-12

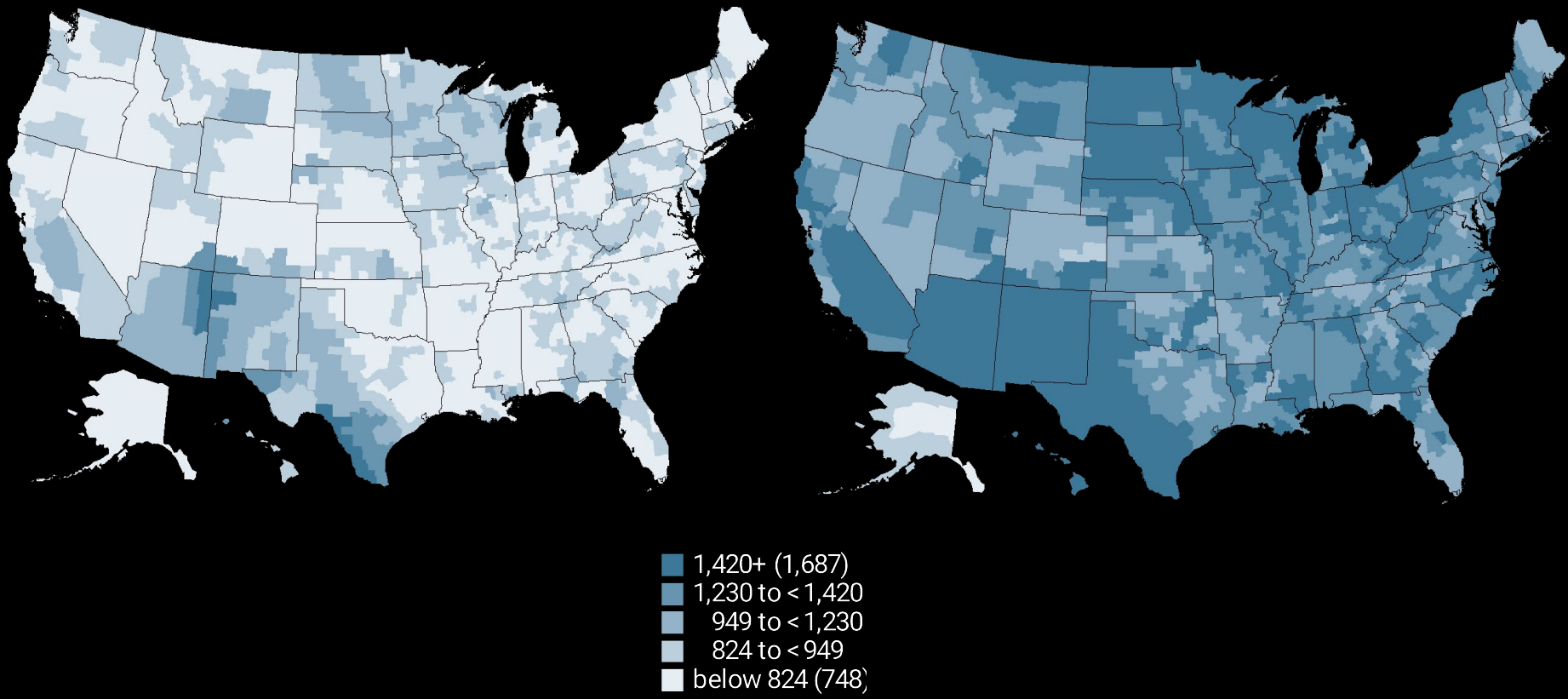
USRDS 2007:

-368,544 dialysis patients
-158,739 transplant patients

- 111,000 INCIDENT ESRD

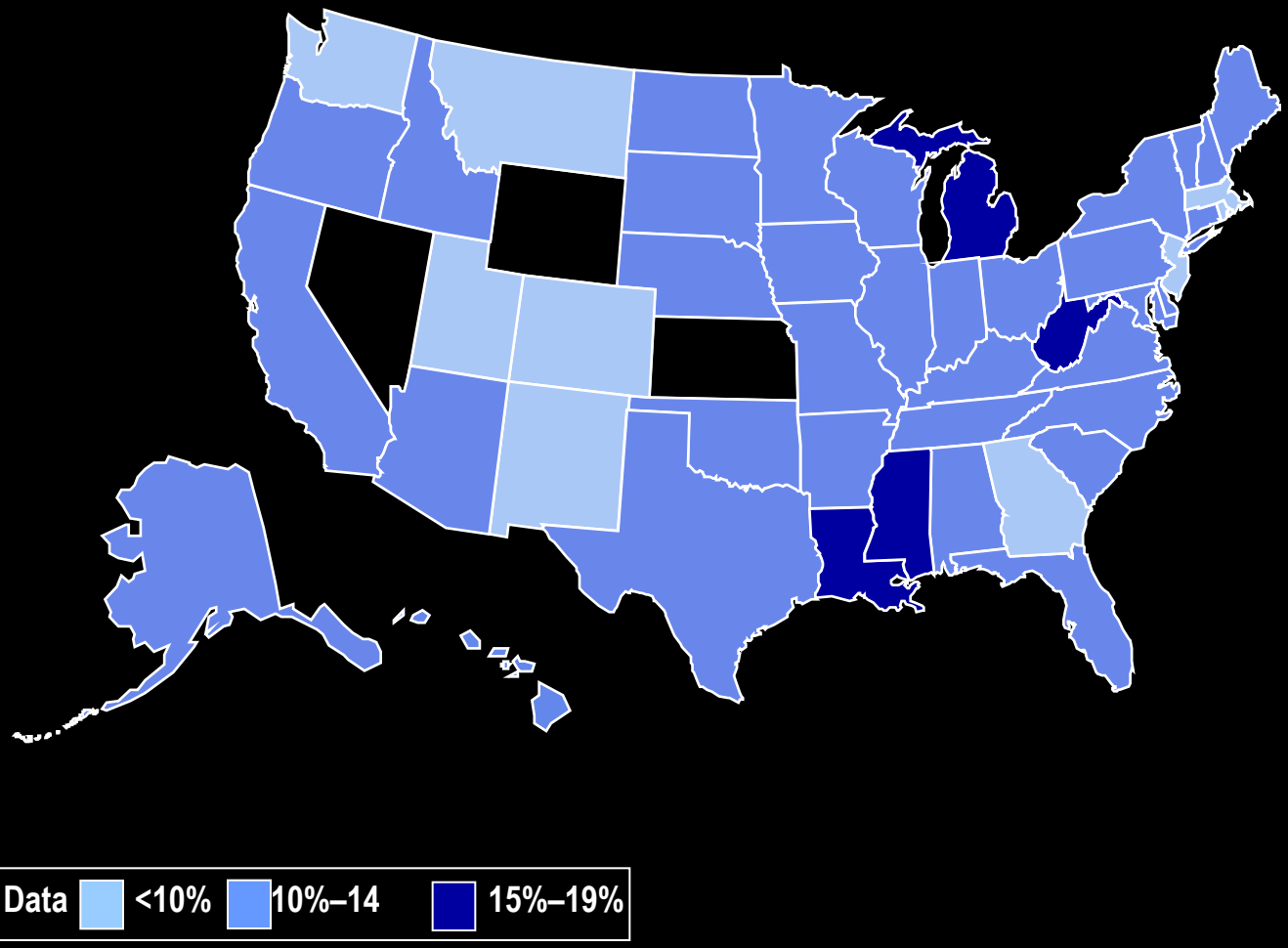
Scope of the problem: CKD is growing

Prevalence of ESRD: 1991 versus 2001 (per million population)



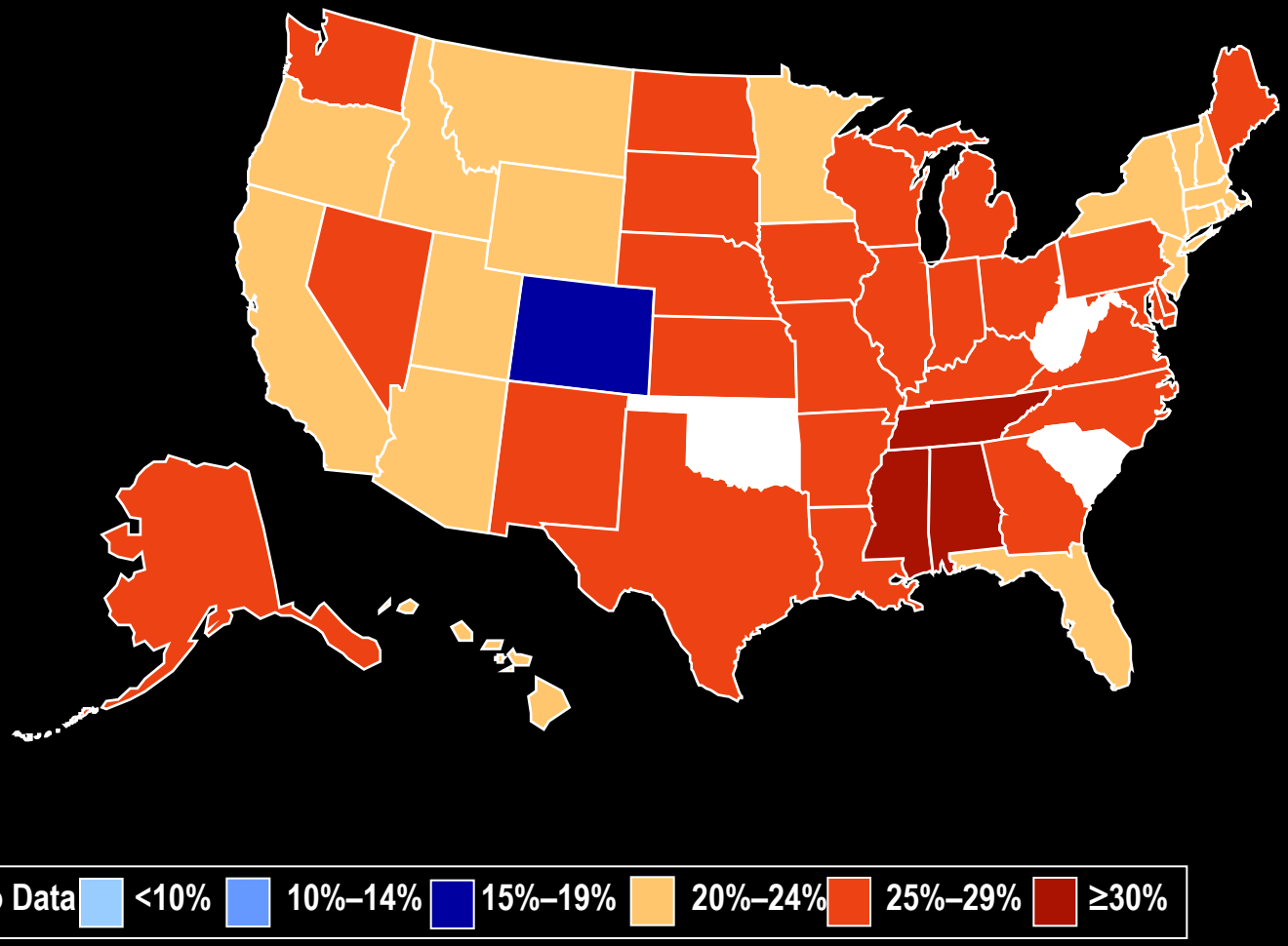
Obesity Trends Among U.S. Adults 1991

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)



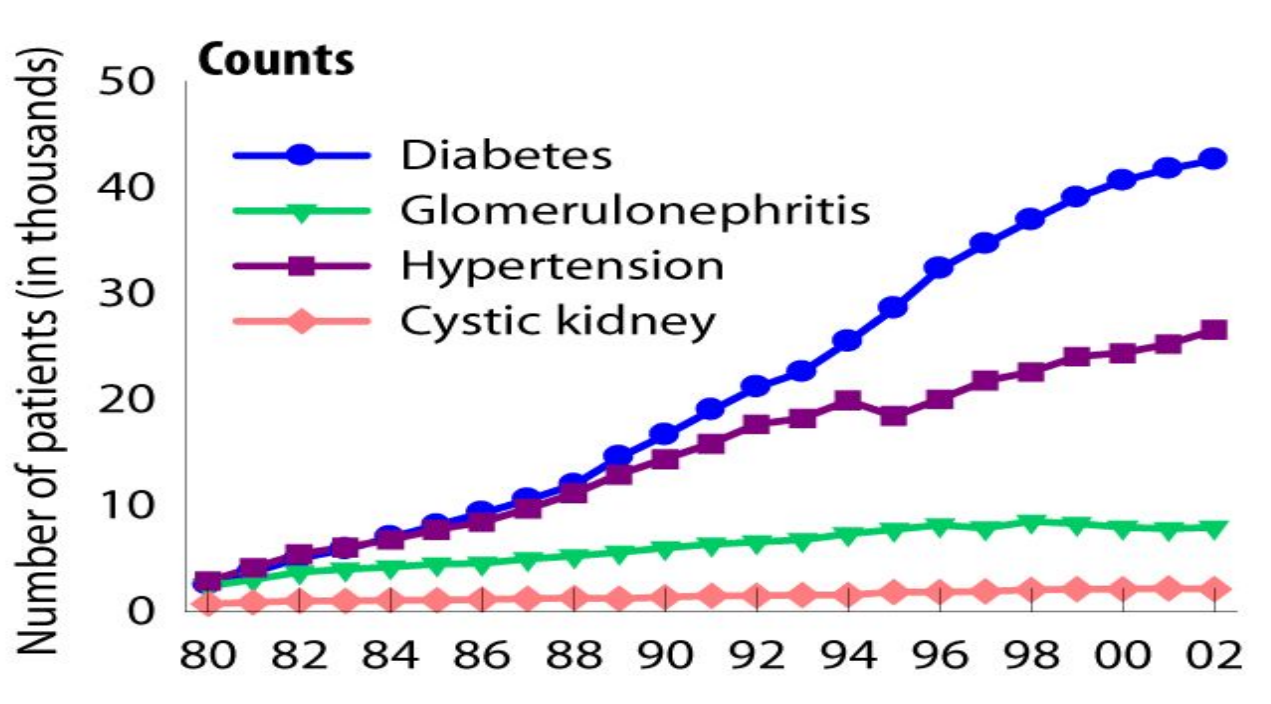
Obesity Trends Among U.S. Adults 2008

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)



Incident Counts & Adjusted Rates, By Primary Diagnosis

CKD as the extreme of the Metabolic Syndrome



USRDS, 2004

Metabolic Syndrome and Renal Progression

Table 1. *Fructose feeding results in development of traits of the metabolic syndrome*

Diet	TG, mg/dl	Cholesterol, mg/dl	Uric Acid, mg/dl	Insulin, pM
Normal	161±12.5	76±3.2	1.6±0.10	3.0±0.3
Dextrose	107±8.9*	64±2.4*†	1.7±0.09	3.2±0.3
Fructose	373±38.7*	90±4.3*	1.5±0.12	4.8±0.5*

Diet	Proteinuria, mg/dl	$C_{creatinine}$, ml/min
Normal	33±5.7	1.23±0.04
Dextrose	35±7.5	1.16±0.08
Fructose	73±15.4*	0.96±0.08*

Gersch Am J Physiol Renal Physiol 293: F1256–F126

Metabolic Syndrome and Renal Progression

Abnormal **diet** (high fructose as an example)

- -high salt (hypertension, inflammation, mortality)
- -carbohydrates (diabetes mellitus, obesity, salt retention)
- -high protein (glomerular hypertension)
- -saturated fatty acid, cholesterol (cardiovascular events)

→metabolic syndrome including salt retention (chronic volume overload) →endothelial damage →inflammation →difficult to control hypertension (diabetes, OSA) →proteinuria →renal progression and cardiovascular disease→hypoalbuminemia/mortality

Metabolic Syndrome and Renal Progression-2

Some of the benefits of exercise in CKD:

- Better blood pressure control even in ESRD patients
- Better volume control (sweating)
- Less chronic inflammation
- Improved insulin sensitivity
- Less depression=better compliance
- Weight loss=better OSA control

Risk Factors for CKD- *Modified*

- Diabetes (type 1 and type 2)
- Hypertension
- Advancing age
- Proteinuria
- Family history of kidney disease
- Environmental nephrotoxins (NSAIDs)
- Race
- Metabolic syndrome
- OSA

- Diabetic Nephropathy can now be halted with intensive treatment if referred early
- BP driven by volume (may be hidden, difficult to appreciate) and increased sympathetic activity
- Proteinuria- less in OSA, driven by BP and volume and obesity

Healthy People 2010; Nelson NA et al, *Am J Nephrol, 1999;* US Renal Data System. *2001 Atlas of*

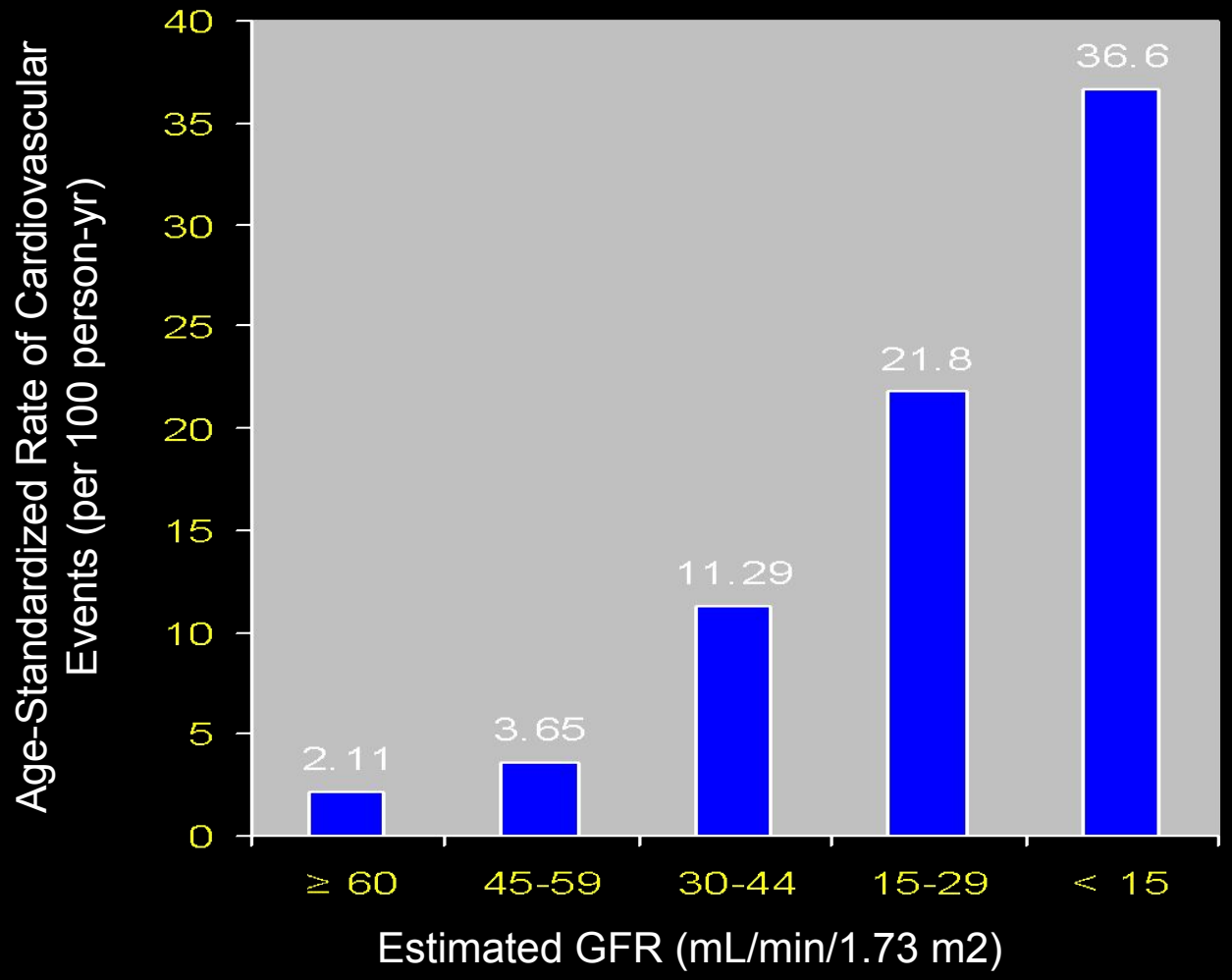
Cardiovascular Risk and CKD

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC VII)

Major Cardiovascular Risk Factors:

- Hypertension
- Cigarette Smoking
- Obesity (BMI>30)
- Physical Inactivity
- Dyslipidemia
- Diabetes Mellitus
- Microalbuminuria or Estimated GFR<60
- Age (>55 for men, >65 for women)
- Family history of premature coronary artery disease (men<55, women<65)

CKD Predicts CVD



Cardiovascular and Renal Outcomes of CKD

3 major outcomes:

1. Stable CKD= BP control, control of proteinuria, control of volume status, control of underlying disease (e.g. diabetes)
2. Progress to ESRD=start dialysis teaching, access and transplant referral, frequent dietary assessments for malnutrition-inflammation syndrome
3. Sudden cardiac death=accelerated atherosclerosis with coronary syndromes (worsened by chronic inflammation and infections) and CARDIAC FIBROSIS with arrhythmic events (the latter is the most common outcome of CKD)

Sudden Cardiac Death and CKD

Unlike in the non-CKD population sudden cardiac death in CKD is often:

- not due to coronary artery disease
- risk of coronary events are higher after a major infection (at least in ESRD)
- Is due to cardiac fibrosis-related arrhythmias associated with

-chronic volume overload

-left ventricular hypertrophy (often with diastolic dysfunction)

-hyperkalemia

-sympathetic nervous system activation

-RAS activation

“Ninety percent of medicine is patient education; the rest is art”

Unknown Hungarian Doctor-Philosopher

CKD Patients are different

- Different set of mortality predictors
- Different medication pharmacokinetics and adverse effects: sulfonylureas, insulin, methformin, antibiotic dosing, seizure medication dosing, different reaction to antihypertensive medications
- Different and additional problems: bleeding tendency (warfarin and atrial fibrillation), immunocompromized state, volume overload due to diastolic dysfunction……
- Special psychological issues

Patient education in CKD: a special challenge

- CKD patients are often the ones who got there because of established non-adherence patterns
- CKD as a chronic disease is often associated with depression
- CKD often progresses with minimal symptoms: denial is a common problem
- Late referral is still common (patient shocked at the first visit by the need for access and proximity of dialysis)
- CKD often affects the poorly educated or illiterate with often minimal understanding about health maintenance issues

Patient education in CKD: a special challenge-2

- CKD patients are often terrified of the prospect of chronic dialysis
- CKD patients are overwhelmed by polypharmacy and related side effects
- CKD patients are overwhelmed by the multiplicity of problems in renal disease
- CKD patients are often approached in a negative manner (do not eat high phosphorus, high salt, high carbohydrate, high fat, high potassium, high protein foods)

Patient education in CKD: Setting objectives

- CKD objective #1: AVOID/POSTPONE the need of dialysis

  -volume, blood pressure, proteinuria, lifestyle changes, control of underlying disease
- CKD objective #2: PREVENT CARDIOVASCULAR OUTCOMES
- CKD objective #3: IMPROVE QUALITY OF LIFE

-prevent progression of renal disease as above; when it is not possible then start renal replacement therapy early- establish access to avoid catheters, close dietary follow up necessary to avoid MALNUTRITION/INFLAMMATION

-strongly consider preemptive transplant or some of the more continuous dialysis therapies

Patient education in CKD: setting priorities

- Understand and explain: phosphorus, PTH or anemia correction are important but have not been shown to decrease mortality
- Mortality is affected by:

-volume control
-control of malnutrition/inflammation
-control of hyperkalemia
-control of blood pressure
-control of proteinuria
-timely creation of access
-prevention of infections
-25 OH vitamin D replacement
-control of depression

- Yet much of the time and most medicines (and most research) are centered on phosphorus and hemoglobin

Patient education in CKD: Focus

- Focus#1: lifestyle modification

-changing diet and exercise is never late

-salt restriction

-weight loss

-fresh foods with minimal preservatives (Na, K, Phos)

-potassium restriction and/or diuretics

- Focus#2: blood pressure/volume/proteinuria control

-check BP at home

-simple, effective combinations, fewer medicines, focus on side effects

-proteinuria as “HgbA1c of BP” in proteinuric CKD

-volume control is key in many cases

-hold ACEI, diuretics when at risk for dehydration

Patient education in CKD: Focus 2

- Focus#3: malnutrition/inflammation

-close dietary follow up to see when uremia is approaching
-exercise, be active
-control BP/volume
-early access when progress cannot be halted to avoid catheters

- Focus#4: compliance

-monitor for depression
-simplify and minimize medicines
-set reasonable goals; establish individualized priorities
-focus on positives: you should not eat this but you can eat that, exercise, activity
-understand that CKD can often be halted with appropriate treatment and compliance
-understand that focusing on lifestyle issues and restructuring priorities (i.e avoiding being lost in detail) may improve outcomes

Dialysis modality and general dialysis Education

1. Lifestyle options- dialysis and work, dialysis and travel, dialysis and exercise etc.
2. Medical factors-cardiovascular disease, volume, phosphorus control
3. Polypharmacy- many of the medications can be discontinued or modified

Proper modality selection may improve quality of life, enhance social functioning, dispel fear, improve depression and related non-adherence, perhaps sometimes obviate the need for antidepressives.

Patient education in CKD: a Study from the CKD clinic*- Background

- Racial disparities in ESRD incidence continue to be dramatic 2007 USRDS Annual Data Report
  - Whites - 268 per million
  - Asians - 355 per million
  - Native Americans - 516 per million
  - **African Americans- 991 per million**
- **Disparity is multi-factorial** Powe Med Clin N AM 2005

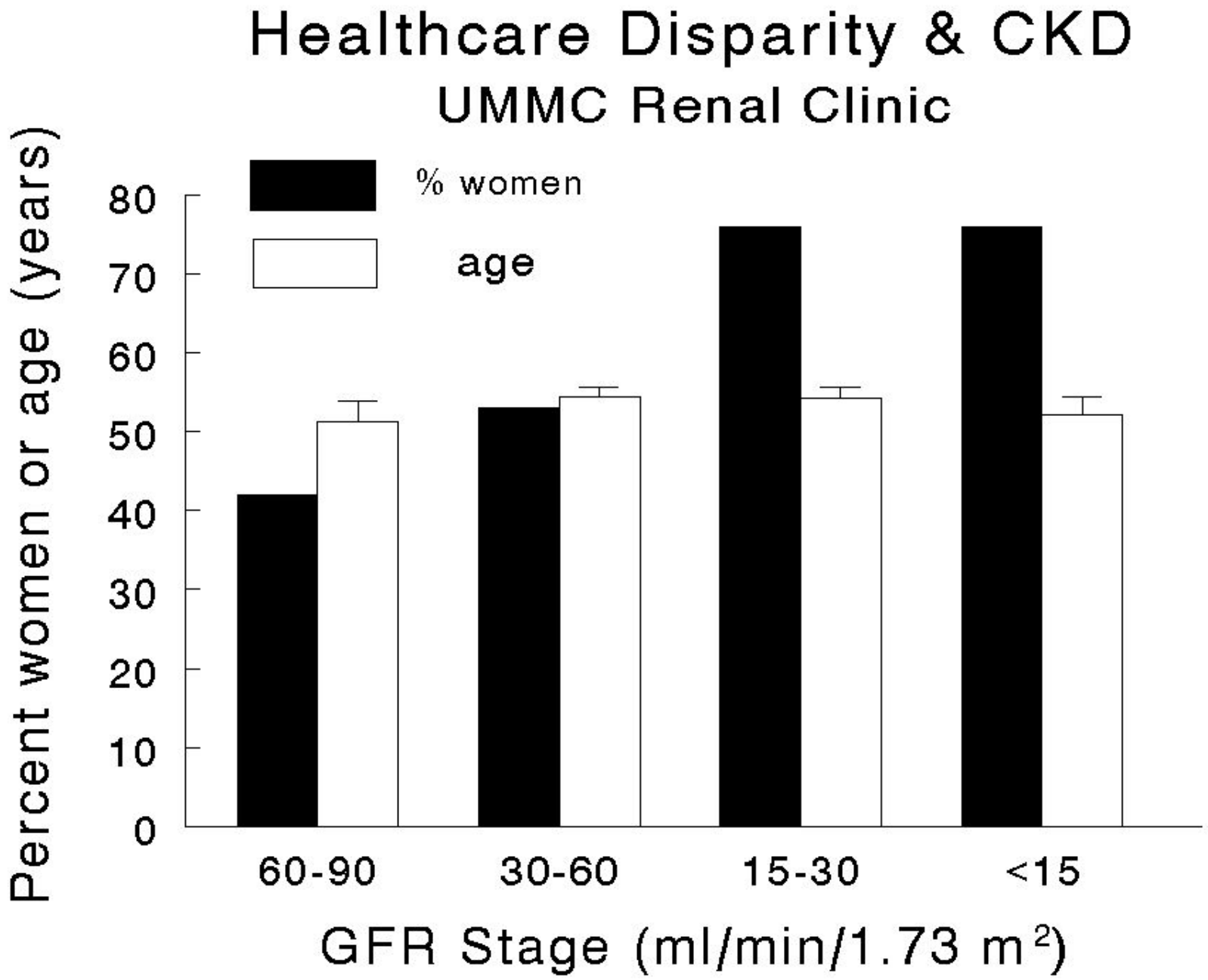
* Courtesy of Dr Flessner

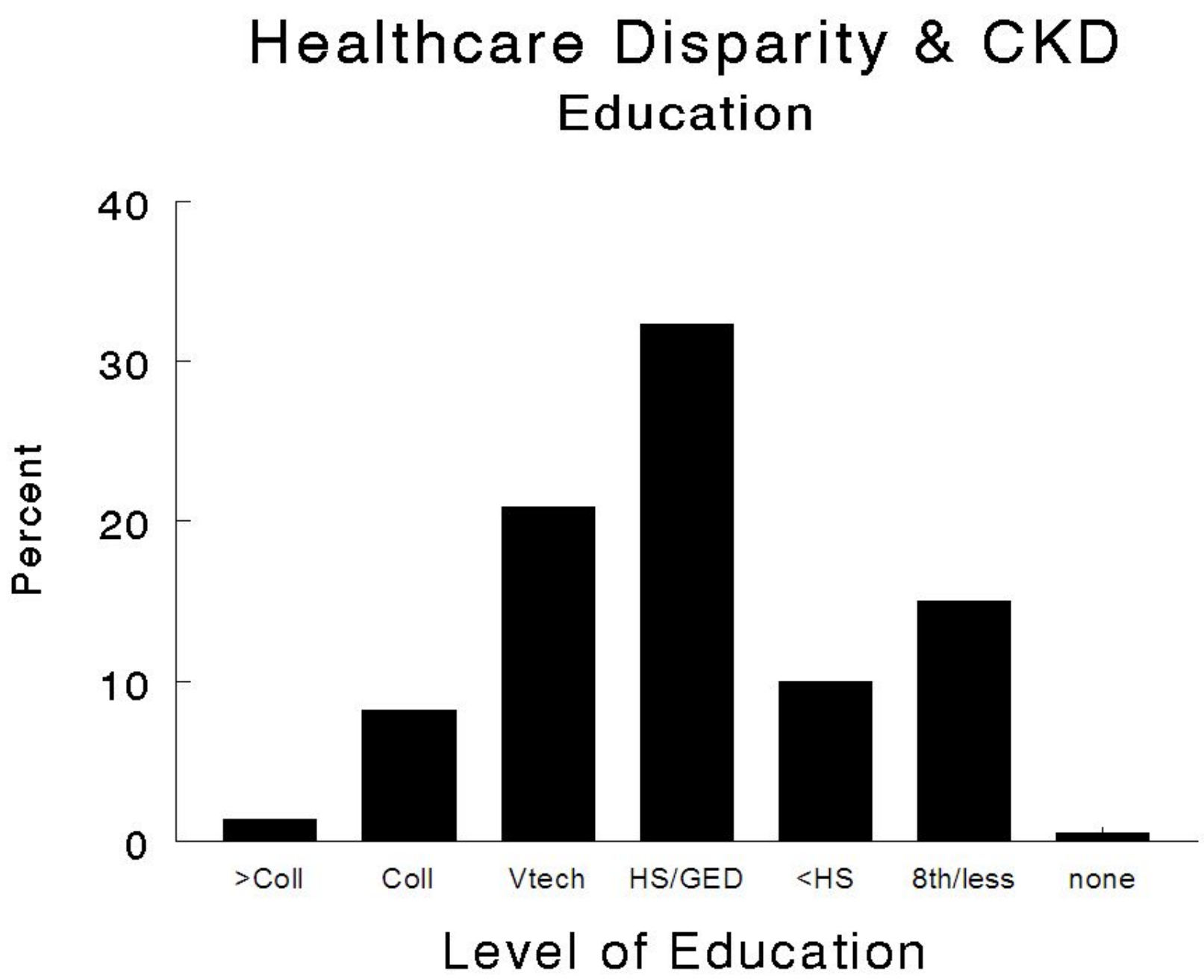
Methods

- Cross-sectional study of 221 patients from the University Medical Center Nephrology Clinic
- 82 males, 139 females
- Ages 18 – 85
- 7 < eGFR < 75ml/min/1.73m² (MDRD) and no history of dialysis
- **Exclusion Criteria**:
  - Pregnancy
  - Unable to give consent or cooperate with data collection

Methods

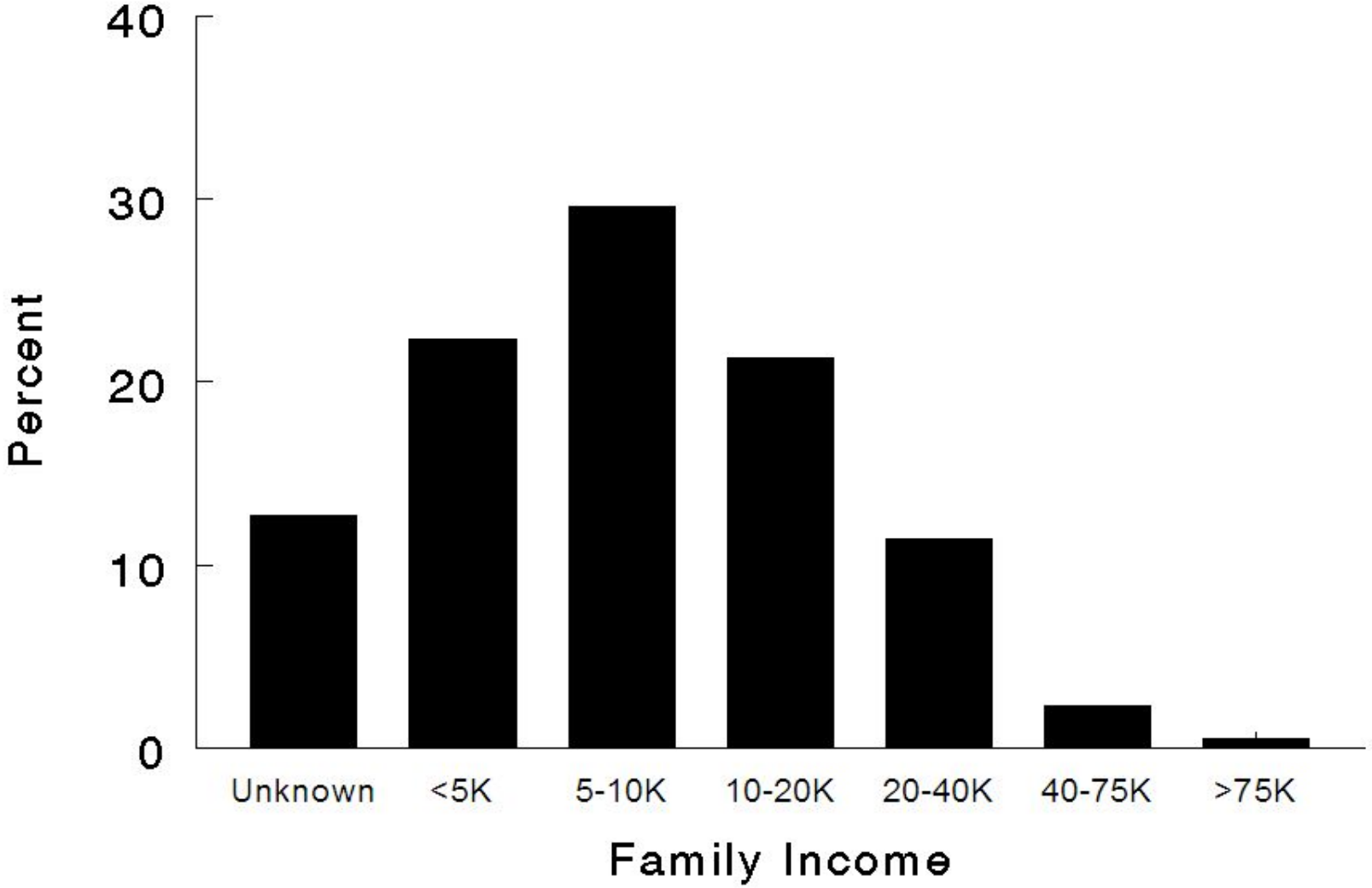
- Patients were divided into NKF stage (ml/min/1.73 m^2; estimated by MDRD eqn):
  - Stage 2: 60-89
  - Stage 3: 30-59
  - Stage 4: 15-29
  - Stage 5: <15
- Data was analyzed with 1-way ANOVA of each variable versus eGFR stage


Healthcare Disparity & CKD
UMMC Renal Clinic
% women
age
Percent women or age (years)
0
10
20
30
40
50
60
70
80
60-90
30-60
15-30
<15
GFR Stage (ml/min/1.73 m2)


Healthcare Disparity & CKD
Education
Percent
40
30
20
10
0
>Coll
Coll
Vtech
HS/GED
<HS
8th/less
none
Level of Education

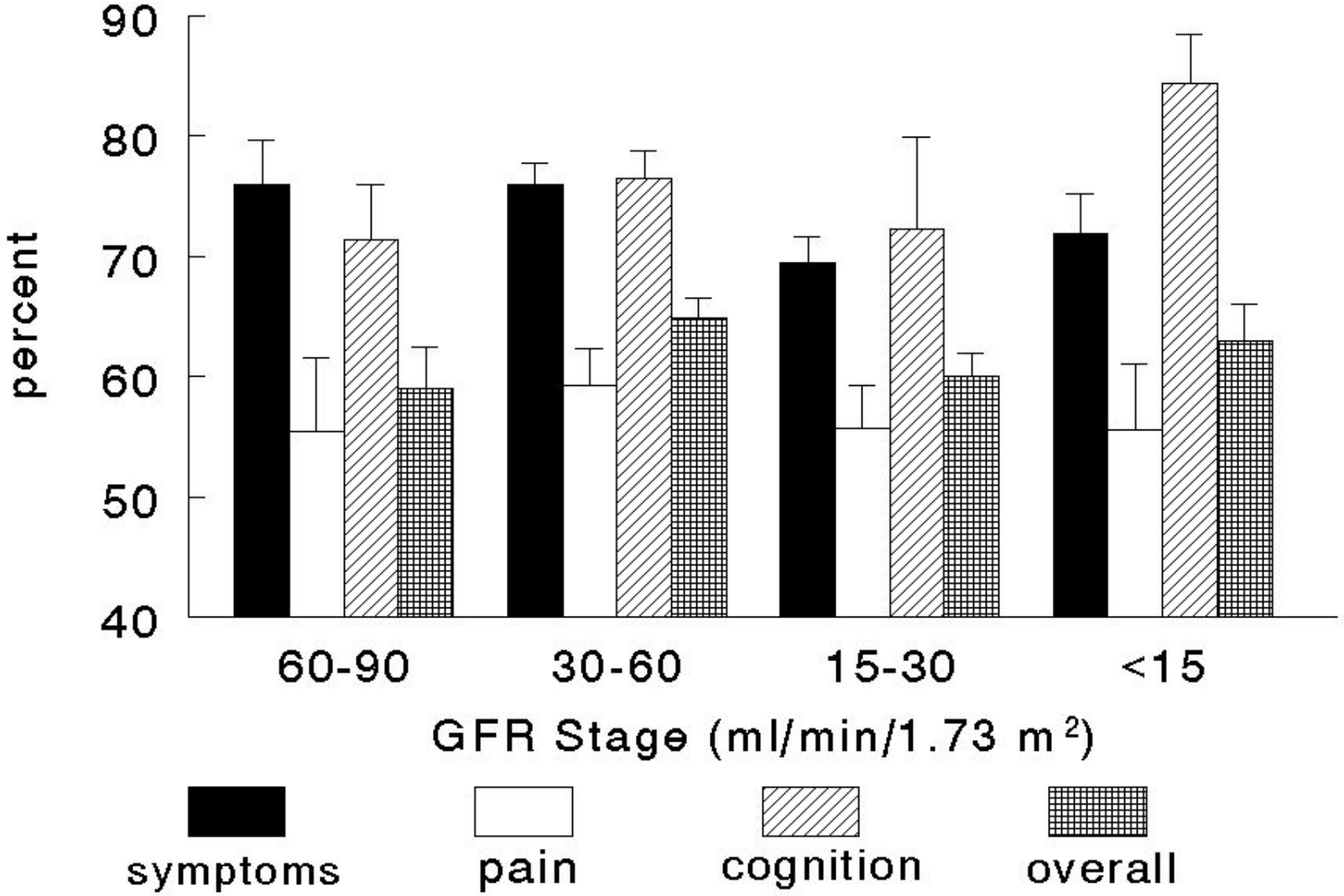
Healthcare Disparity & CKD

Income



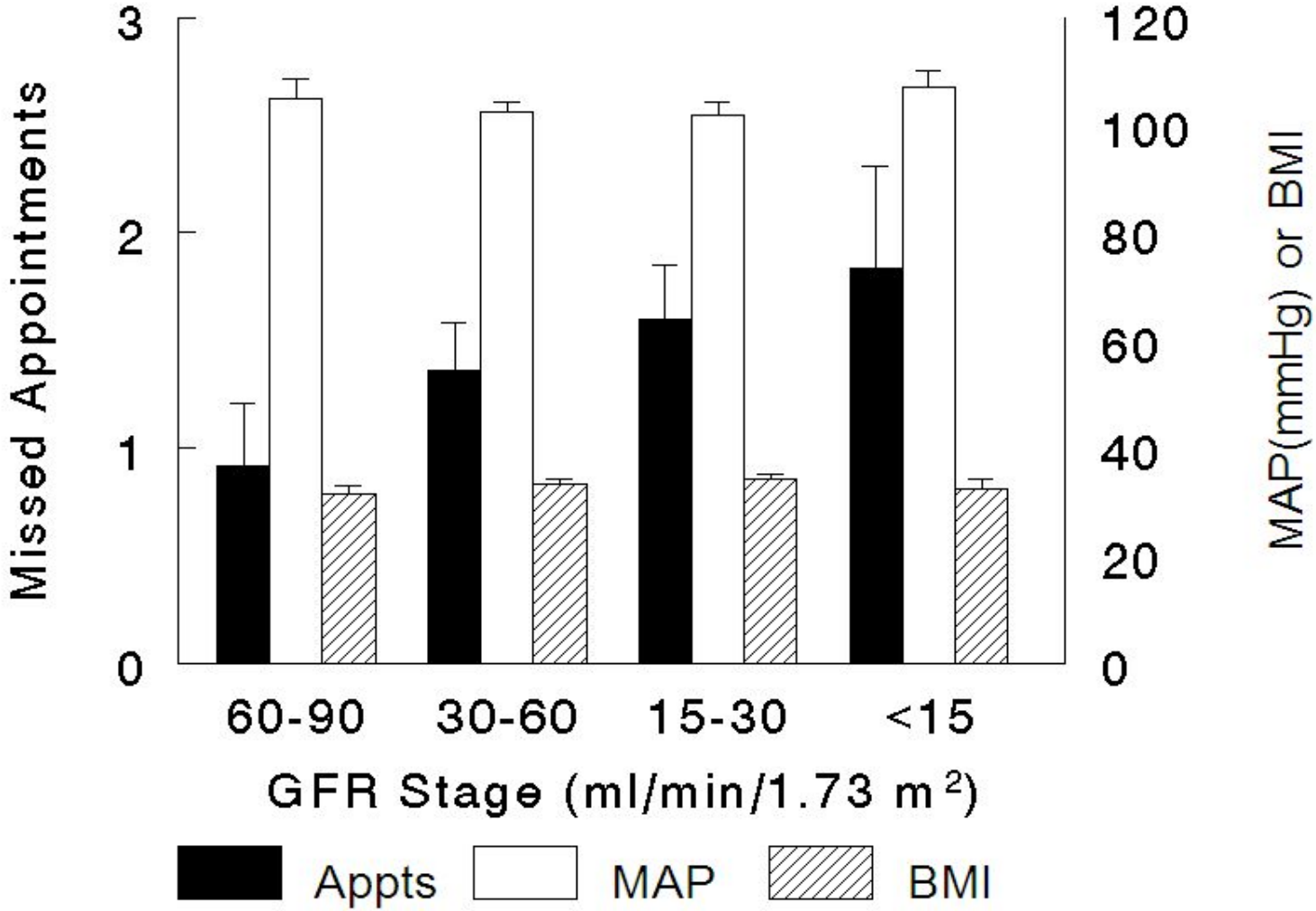
Healthcare Disparity & CKD

Higher Score ≈ Less Quality of Life



Healthcare Disparity & CKD

Adherence, BP, BMI



Patient education in CKD: examples from the CKD clinic

- **Patient#1:**
  Elderly woman with eGFR=25 received a native fistula in 2008 based on KDOQI recommendations. In 2010 eGFR is still 25-30, patient is asymptomatic.
- **Patient#2:**
  Elderly diabetic woman with CKD III due to DIABETIC NEPHROPATHY on minimal sulfonylureas was told to exercise. She bought and regularly used a treadmill. Admitted to hospital after passing out from severe hypoglycemia. Sulfonylureas were then tapered and blood pressure medicines reduced.
- **Patient#3:**
  Middle aged woman with advanced CKD on close follow up as she was approaching ESRD. Denies uremic symptoms. Progressive weight loss identified. On repeated questioning patient admitted to almost starve to avoid dialysis and keep phosphorus normal.

Conclusions

- Chronic Kidney Disease is defined on the basis of either adecreased GFR or presence of persistent proteinuria. Both proteinuria and decreased GFR represent major risk for adverse renal and cardiovascular outcomes.
- CKD must not be diagnosed by eGFR alone; the underlying disease (if any) needs to be identified whenever possible.
- CKD is assuming epidemic proportions among US adults and is associated with the Metabolic Syndrome in the majority of cases.
- CKD may or may not be progressive; common predictors of good outcome include control of blood pressure, volume, proteinuria and the underlying condition (e.g. diabetes).
- Most patients with CKD never reach dialysis the most common cause of demise being sudden cardiac death.

Conclusions-2.

- CKD patients are often poorly educated, depressed, poor, have poor quality of life and (given the paucity of symptoms at the early stages) may often be in denial; some of these factors raise barriers to patient education and result in non-adherence to therapy.
- CKD can be stabilized by lifestyle modification combined with lifelong medical treatment so patient education is the key to success.
- Establishing clear objectives; prioritizing goals; keeping close rapport; addressing depression and quality of life issues may often contribute to better adherence to therapy and stabilization of CKD.
- If CKD progresses despite medical therapy early referral for dialysis access, transplant referral, close nutritional monitoring and timely initiation of renal replacement therapy may improve clinical outcomes.