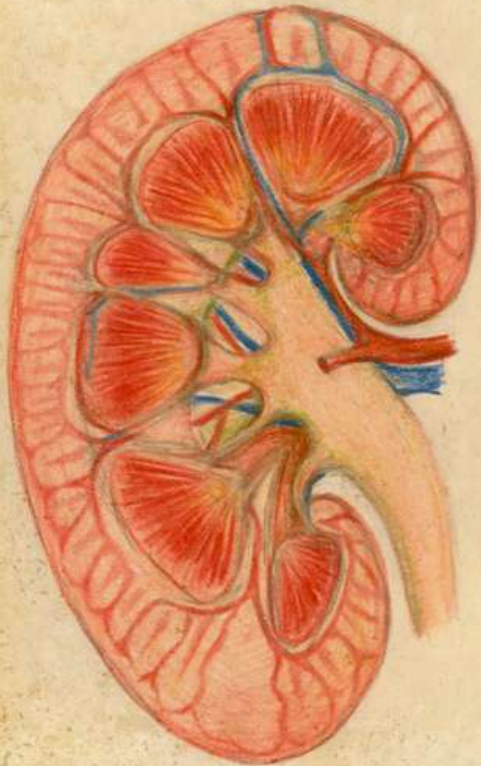
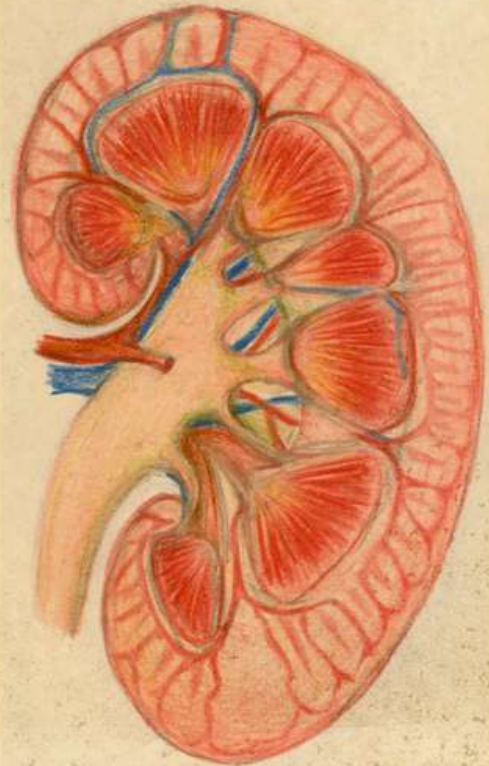


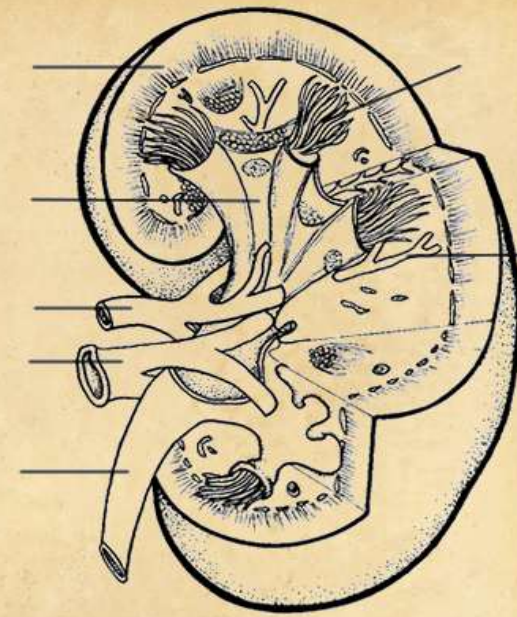
“KIDNEY ... Baby One More Time!”



January 19, 2012
Bugante – De Gracia



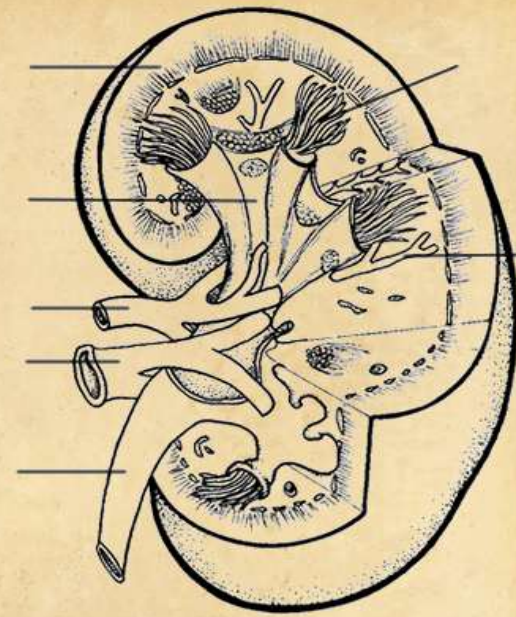
OBJECTIVES



- Identify pertinent findings from the history and physical examination that would contribute to the diagnosis of renal failure
- Provide a systematic approach in diagnosing patients with renal failure
 - Establish the type of renal failure
 - Determine supportive diagnostic examinations
 - Arrive at a definitive diagnosis
- Learn how to conservatively manage patients with renal failure

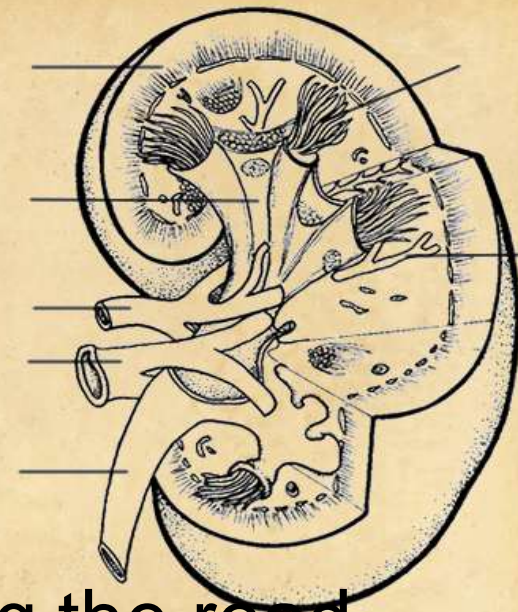
Patient Profile

- N.F.
- 55 year-old female
- Married, Filipino, Roman Catholic
- From Makati City
- Admitted for the first time on December 3, 2011



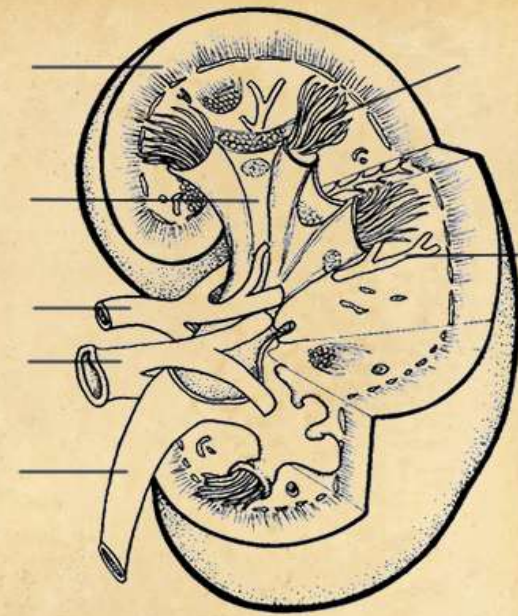
Patient Profile

- Land lady
- Lives in a bungalow, located along the road, with 5 occupants
- With electricity, MAYNILAD as source of water
- Garbage collected daily



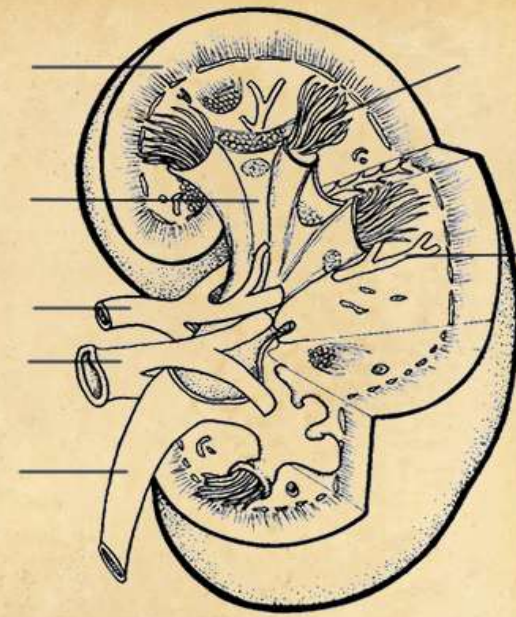
Patient Profile

- Drinks water >1L/day
- Non-alcoholic beverage drinker
- Non-smoker
- Regular bowel movement (1x daily)
- Urinates four to five times daily, total of 2.5L/day



Chief Complaint

- Progressive, generalized body weakness of 8 days duration



Source and Reliability

- The patient herself with fair reliability

INTENSITY

9 8 7 6 5 4 3 2 1 0

DAYS PTA

- FEVER**
- GENERALIZED BODY WEAKNESS**
- DECREASED APPETITE**
- EPIGASTRIC PAIN**
- BIPEDAL EDEMA**

INTENSITY

9 8 7 6 5 4 3 2 1 0

DAYS PTA

- FEVER**
- GENERALIZED BODY WEAKNESS**
- DECREASED APPETITE**
- EPIGASTRIC PAIN**
- BIPEDAL EDEMA**



INTENSITY

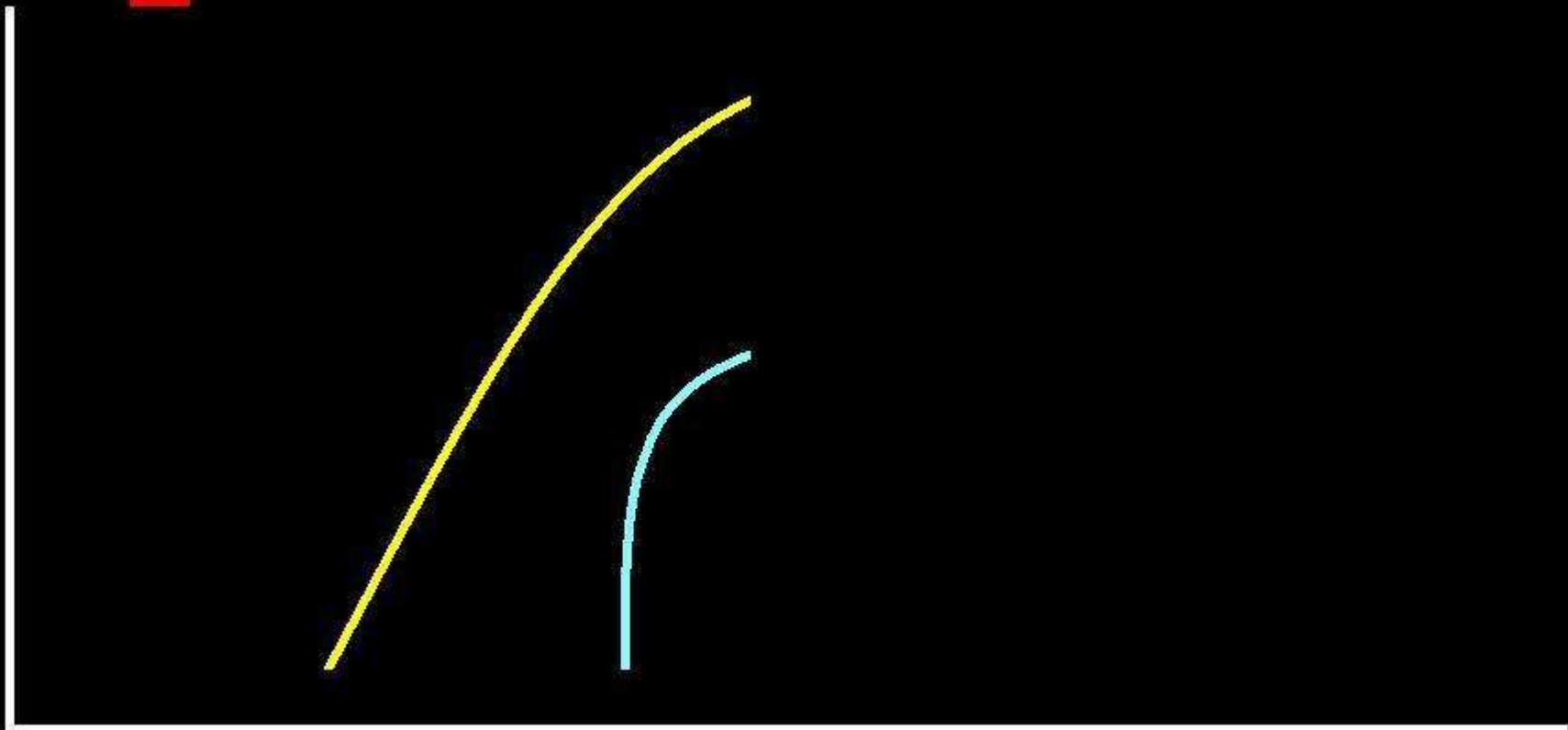


9 8 7 6 5 4 3 2 1 0

DAYS PTA

- FEVER**
- GENERALIZED BODY WEAKNESS**
- DECREASED APPETITE**
- EPIGASTRIC PAIN**
- BIPEDAL EDEMA**

INTENSITY

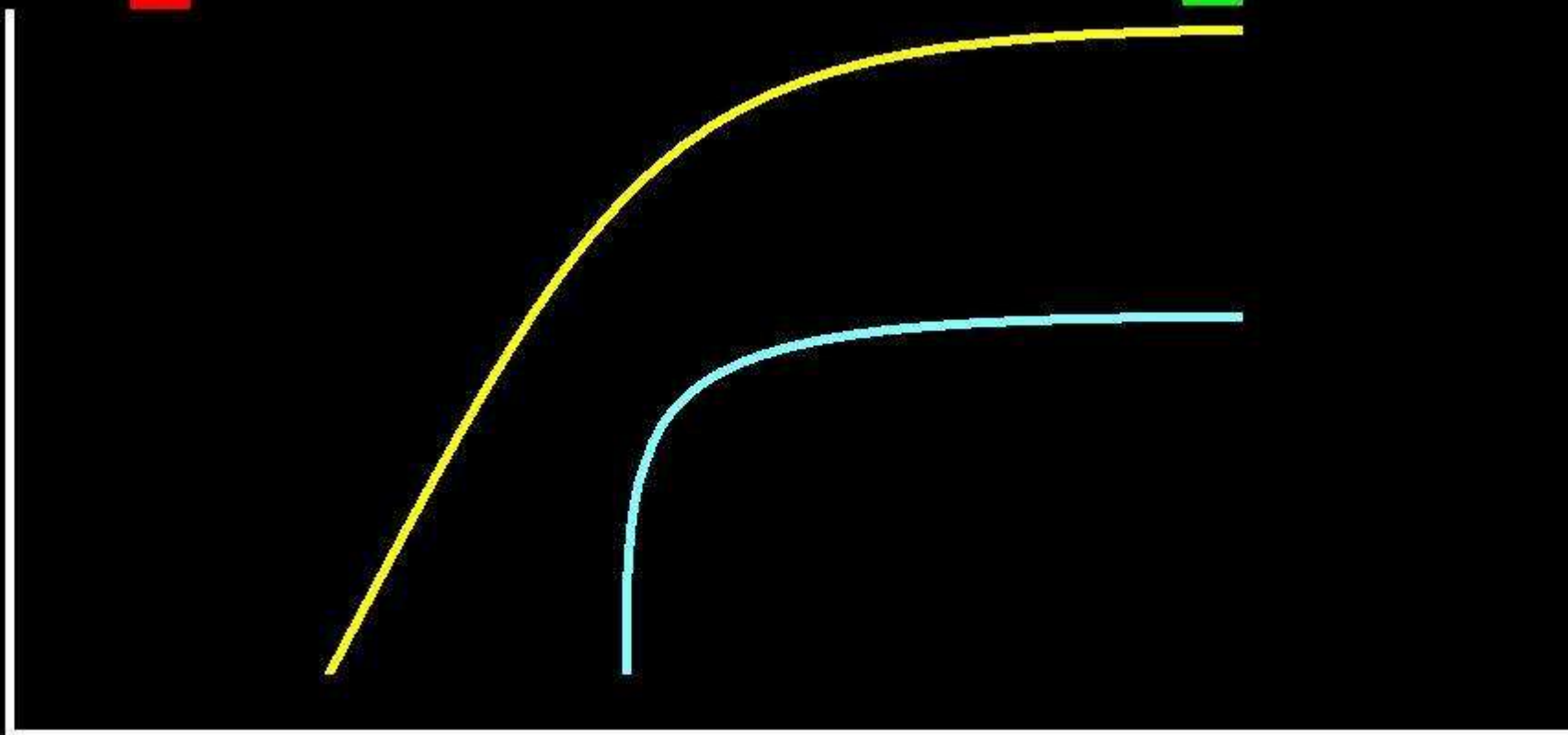


9 8 7 6 5 4 3 2 1 0

DAYS PTA

- FEVER**
- GENERALIZED BODY WEAKNESS**
- DECREASED APPETITE**
- EPIGASTRIC PAIN**
- BIPEDAL EDEMA**

INTENSITY

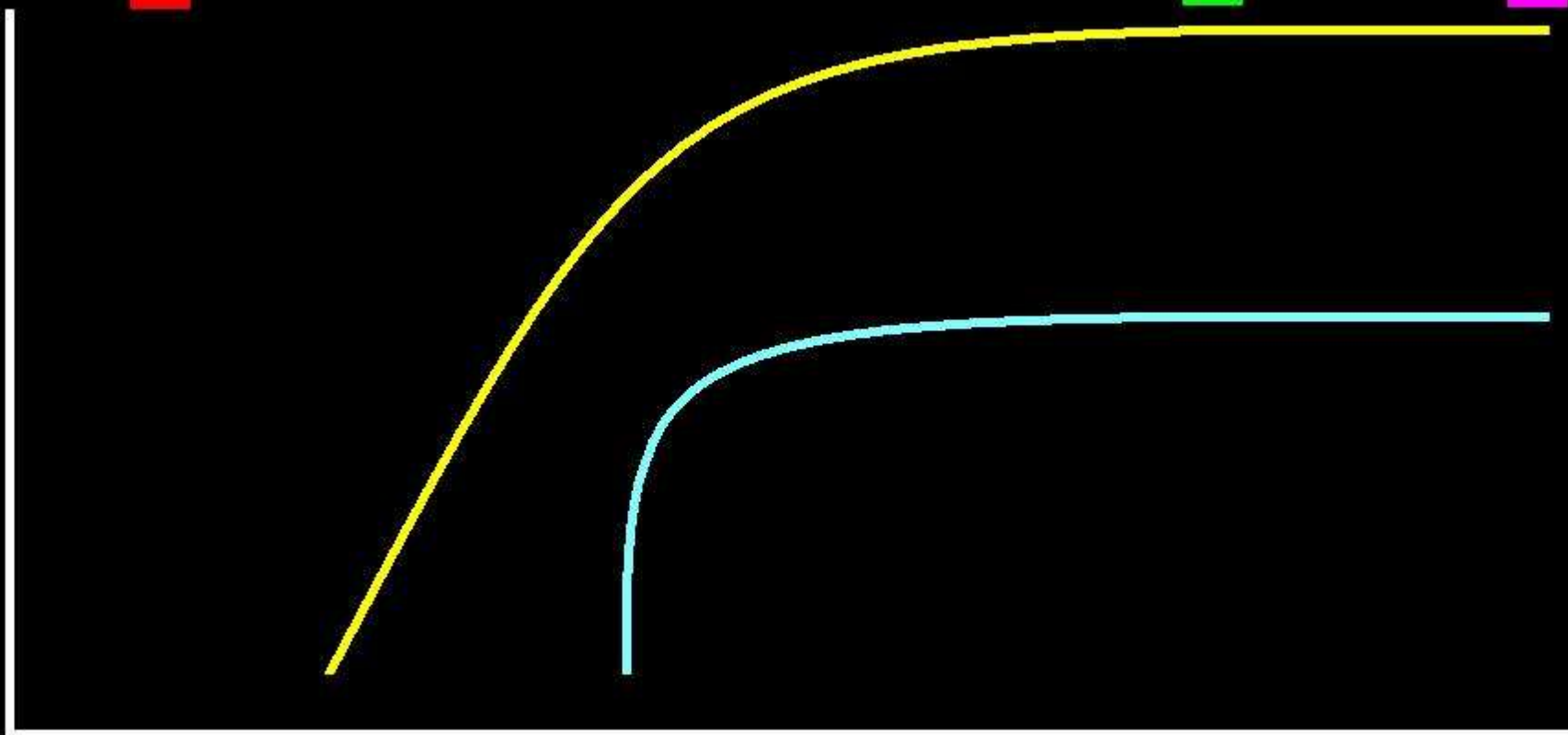


9 8 7 6 5 4 3 2 1 0

DAYS PTA

- FEVER**
- GENERALIZED BODY WEAKNESS**
- DECREASED APPETITE**
- EPIGASTRIC PAIN**
- BIPEDAL EDEMA**

INTENSITY



9

8

7

6

5

4

3

2

1

0

DAYS PTA



FEVER



GENERALIZED BODY WEAKNESS



DECREASED APPETITE

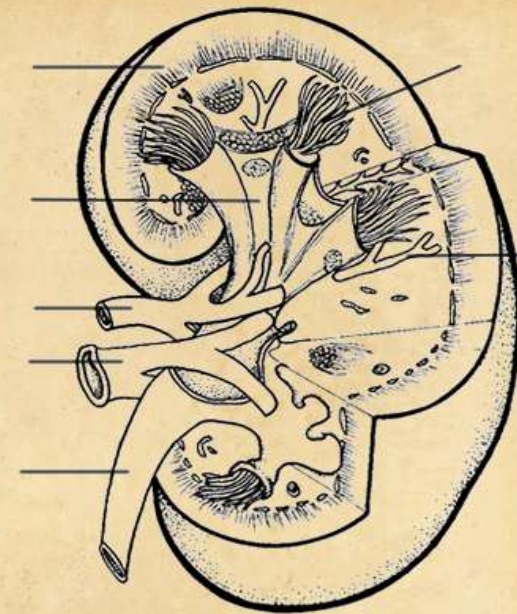


EPIGASTRIC PAIN



BIPEDAL EDEMA

Past Medical History



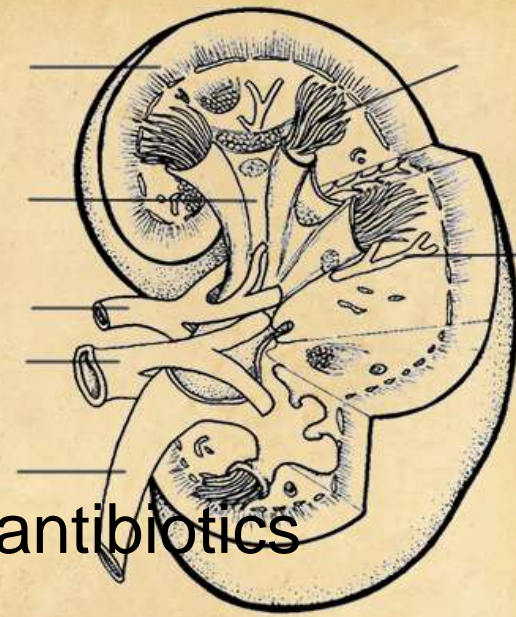
- Hypertension - 2005
 - On Losartan 50mg PRN
 - Usual BPs: 130-140/80-90; Highest BP – 140/90

- Diabetes Mellitus Type 2 - 2005
 - On Gliclazide 80mg BID, with poor compliance

- No regular follow-up check-up with physician

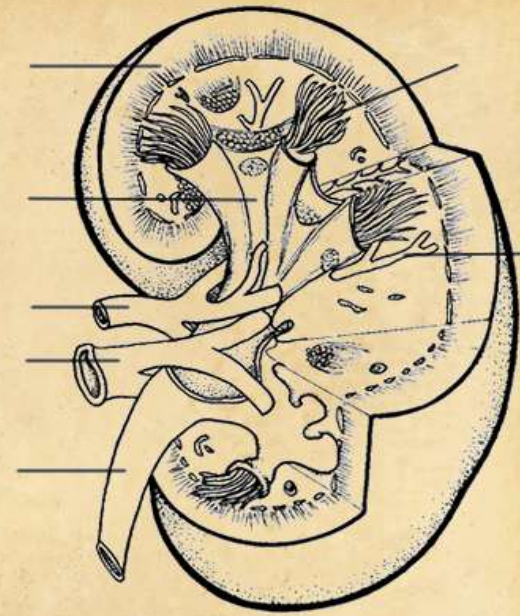
Past Medical History

- Urinary Tract Infection (1997)
 - Treated for 1 month, with unrecalled antibiotics
 - Intermittent episodes of dysuria
 - Self-medicated with Trimethoprim-sulfamethoxazole (Bactrim) 1 to 2 doses per episode which relieved dysuria
- No previous hospitalization or surgery



Family History

- Hypertension – siblings
- Diabetes Mellitus – both sides



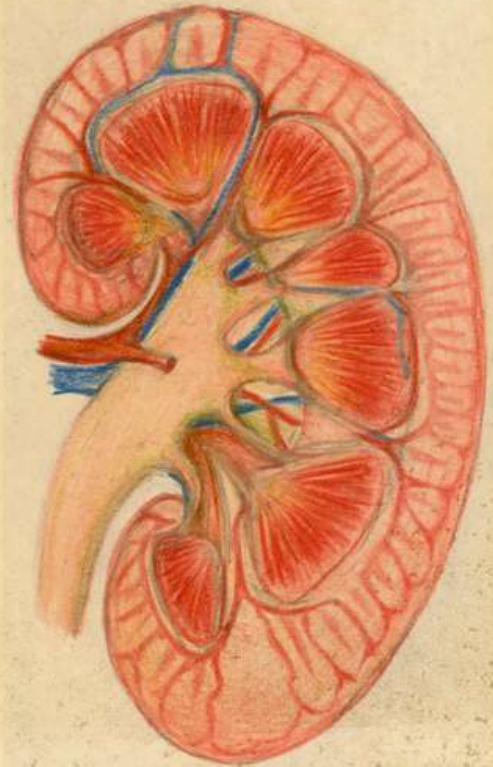
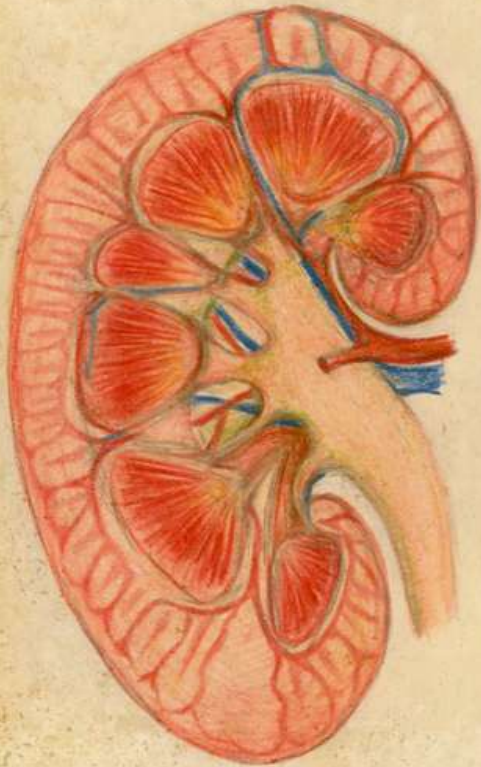
Review of Symptoms

Organ System	Symptoms
General	(-) significant weight loss
Skin	(-) lumps, (-) sores, (-) itching, (-) changes in color; (-) changes in hair or nails, (-) changes in size or color of moles
Head	(-) headache, (-) head injury, (-) dizziness and (-) light-headedness
Eyes	(-) icteric sclerae, (-) pale palpebral conjunctivae
Ears	(-) discharge, (-) hearing loss, (-) tinnitus
Nose	(-) frequent colds, (-) discharge, (-) itching, (-) nosebleed
Mouth/Throat	(-) dentures, (-) hoarseness, (-) dry mouth, (-) frequent sore throats
Neck	(-) swollen glands, (-) no thyroid enlargement, lumps, (-) pain and stiffness
Respiratory	(-) cough, (-) hemoptysis, (-) dyspnea , (-) wheezing,
CVS	(-) dyspnea , (-) orthopnea, (-) palpitations
GIT	(-) dysphagia, (-) nausea and vomiting , (-) melena, (-) jaundice, (-) indigestion, (-) fatty food intolerance, (-) acholic stool, (-) changes in bowel movement
GUS	(+) polyuria , (-) nocturia; (-) hematuria, (-) retention, (-) bleeding

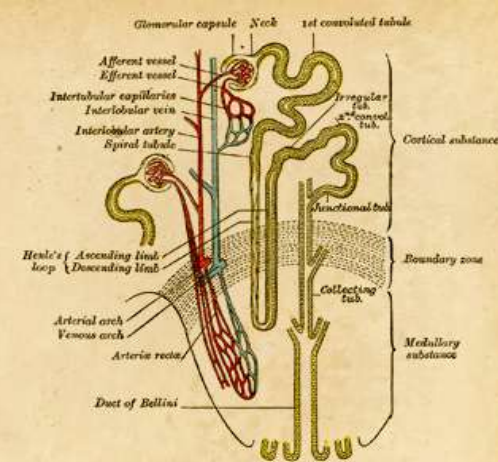
Review of Symptoms

Organ System	Symptoms
Reproductive	(-) menorrhagia, (-) dyspareunia, (-) PCB
Musculoskeletal	(-) ankle pain, (-) swelling, (-) redness, (-) no history of trauma
Psychiatric	(-) nervousness, (-) tension, (-) mood changes, (-) depression, (-) memory change
Neurologic	(-) change in sensorium , (-) memory loss
Hematologic	(-) pallor , (-) easy bruising or bleeding
Endocrine	(-) excessive sweating, (-) excessive thirst or hunger

PHYSICAL EXAMINATION



Admitting Physical Examination



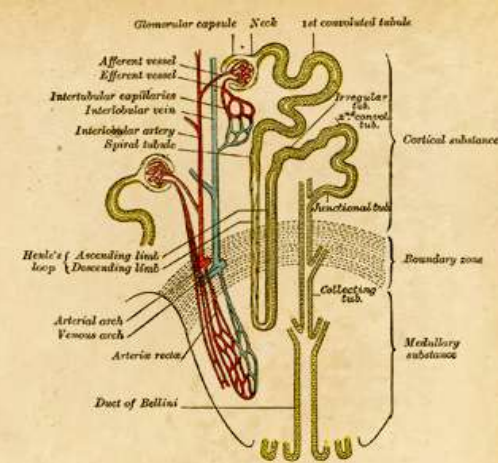
**General
Apperance**

Alert, awake, conscious and coherent

Vital Signs

BP = 140/80 mmHg; HR = 93 bpm; RR = 17 cpm; Temperature = 36.4C; BMI 25.4

Admitting Physical Examination

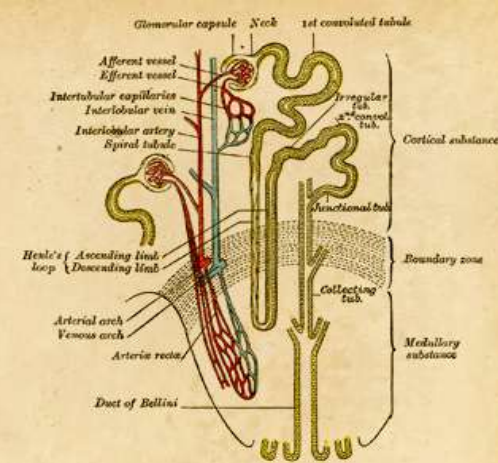


Head and Neck

Dirty sclerae, pink palpebral conjunctivae, **dry oral mucosa**, no tonsillopharyngeal congestion, no cervical lymphadenopathy

Ophthalmologic examination: (+) ROR, OU; Lens opacity, OU

Admitting Physical Examination



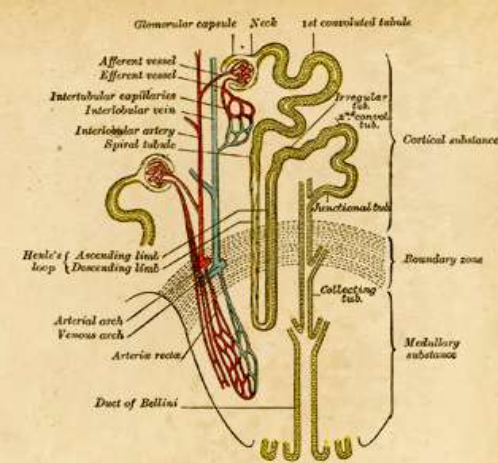
Chest and Lungs

Symmetric chest expansion, no retractions, clear breath sounds

Cardiovascular

Adynamic precordium, normal rate, regular rhythm, distinct S1 S2, PMI at 5th ICS, no murmurs appreciated

Admitting Physical Examination



Abdomen

Flabby abdomen, no scar, normoactive bowel sounds, soft, non-tender upon palpation, no organomegaly

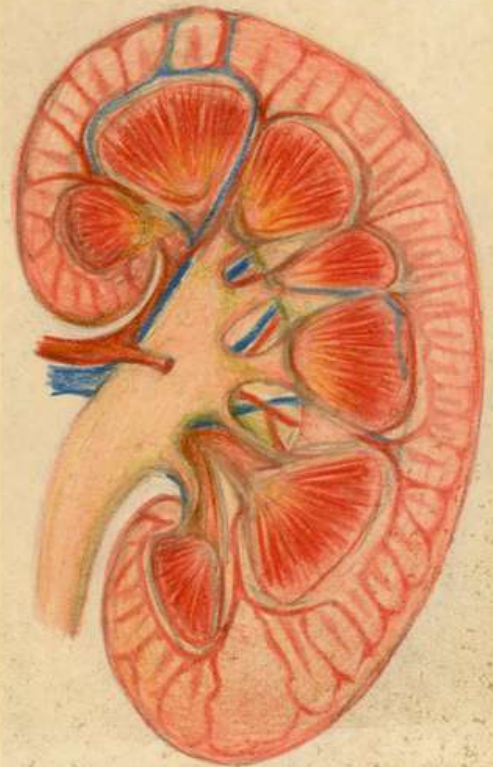
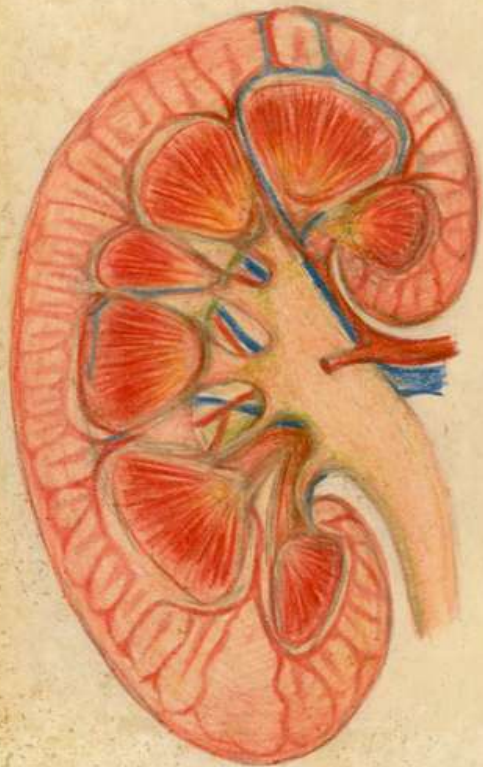
Back

(+) Kidney punch test, right

Extremities

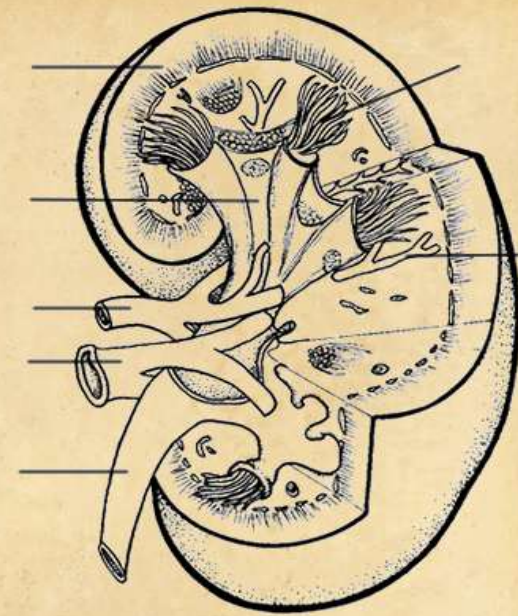
Full and equal pulses, no cyanosis, **(+) bipedal edema, grade 1**

SALIENT FEATURES



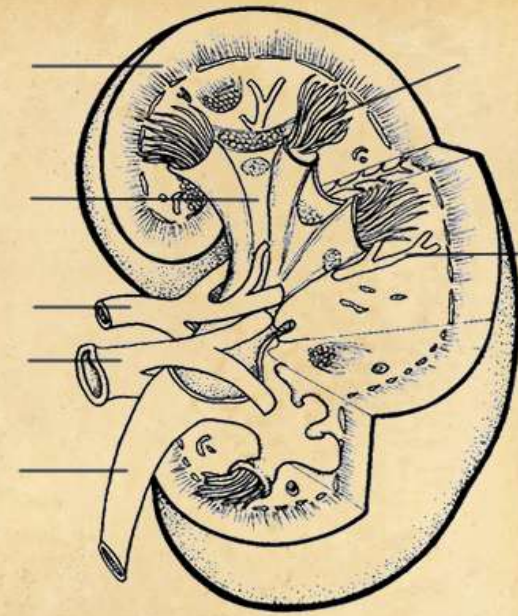
Salient Features

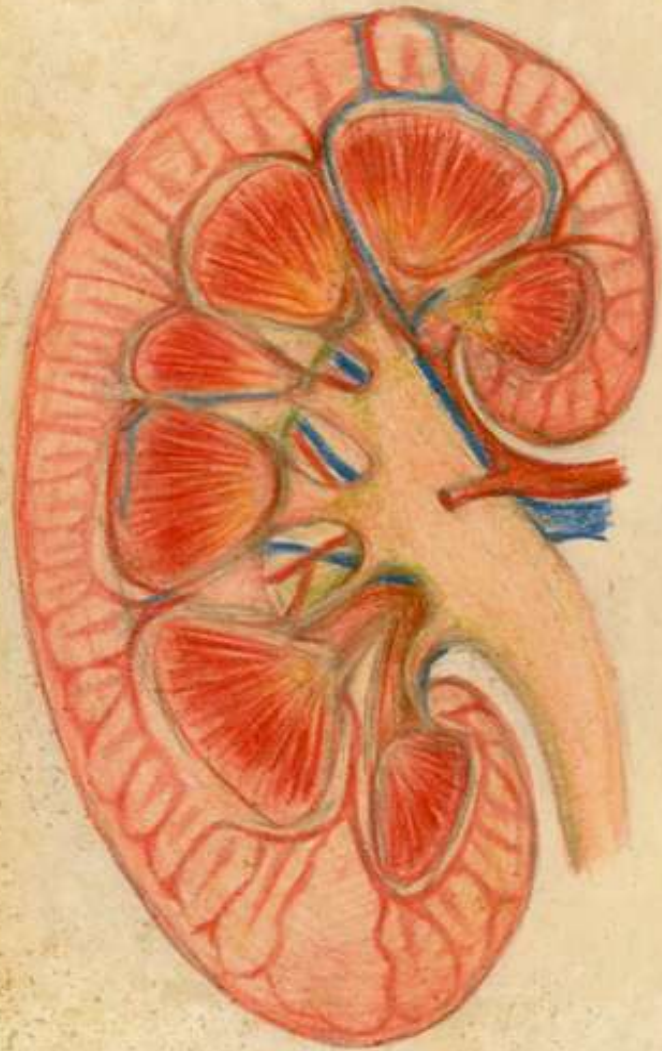
- 55-year-old female
- Diabetic and hypertensive
- Febrile episode
- Progressive, generalized body weakness
- Decrease in appetite
- Epigastric pain
- Polyuria



Salient Features

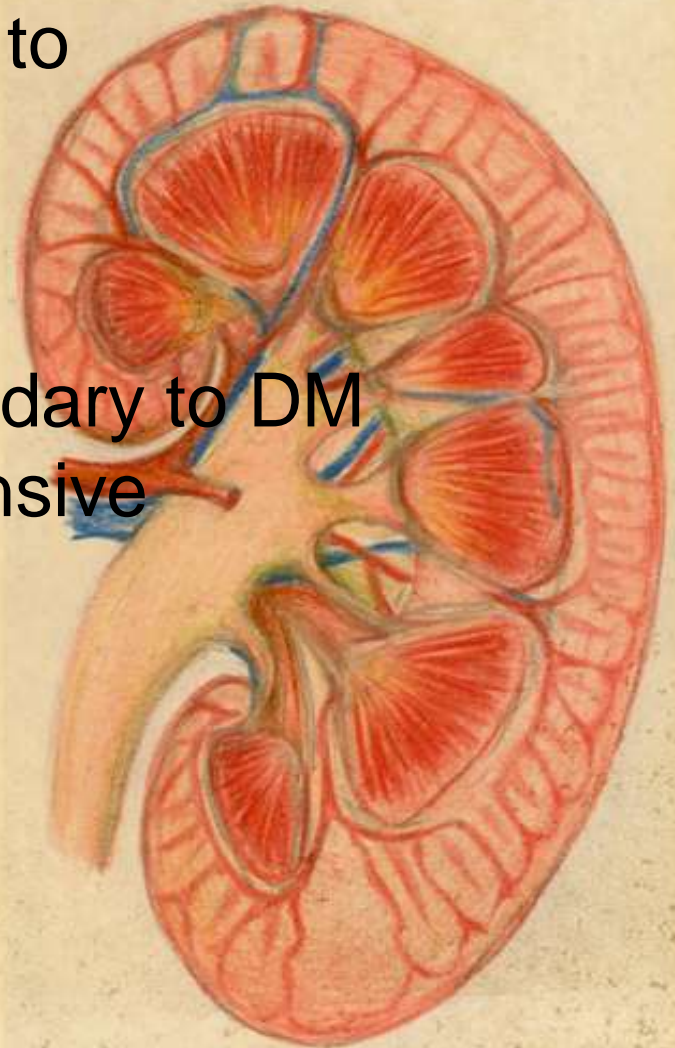
- Dry oral mucosa
- Kidney punch test, right
- Grade 1 bipedal edema





**ADMITTING
IMPRESSION**

- Complicated Urinary Tract Infection/Acute Pyelonephritis
- Acute Kidney Injury secondary to
 1. Dehydration
 2. Infection, on top of...
- Chronic Kidney Disease secondary to DM
Nephropathy versus Hypertensive Nephrosclerosis
- Hypertension
- DM Type 2, uncontrolled



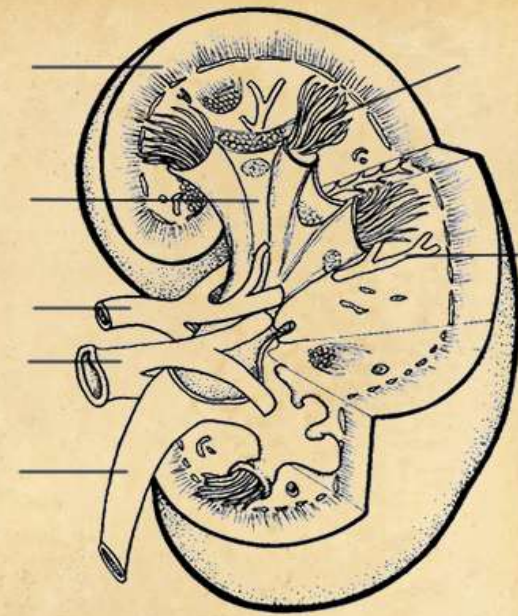
Complicated Urinary Tract Infection

- Older age
- Diabetic
- Febrile episode
- Progressive, generalized body weakness
- Decrease in appetite
- Epigastric pain
- Polyuria
- Kidney punch test, right



Complicated Urinary Tract Infection

- Lower or upper tract infection
- Is present when pathogenic microorganisms are seen in the urine, urethra, bladder, kidneys or prostate
- Occurs in diabetic patients as a result of the following etiologic agents:
 - Escherichia coli
 - Yeast species

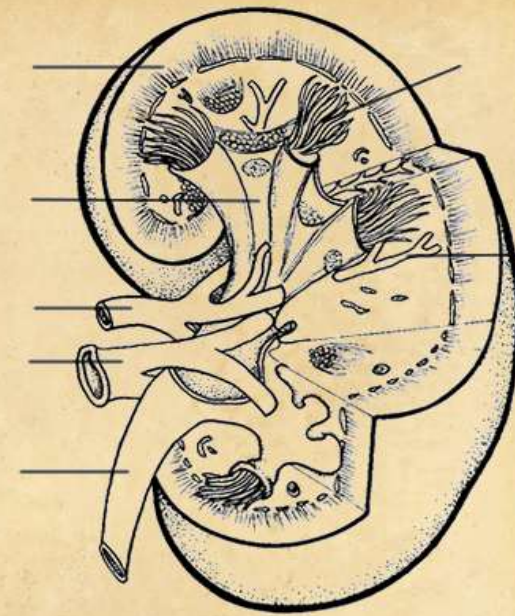


Complete Blood Count

Panels	12.04.11 HD2
Hemoglobin	102
Hematocrit	29
RBC	3.7
WBC	15.2
Neutrophils	94
Lymphocytes	5
Monocytes	1
Eosinophils	
Basophils	
Platelets	681
Remarks	Slightly hypochromic, normocytic

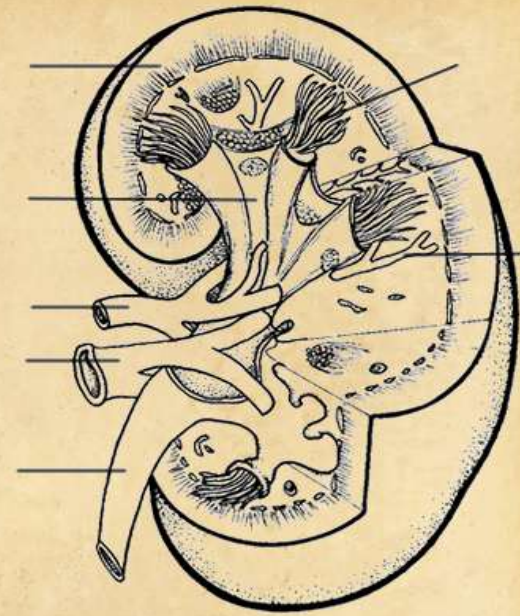
Urinalysis

Color	Yellow
Turbidity	Cloudy
Reaction	Acidic
Specific Gravity	1.015
Protein	Negative
Sugar	Trace
RBC	3-5/hpf
WBC	Many
Casts	None
Bacteria	Few
Epithelial cells	None
Mucus Threads	None
Crystals	None
Yeast Cells	None

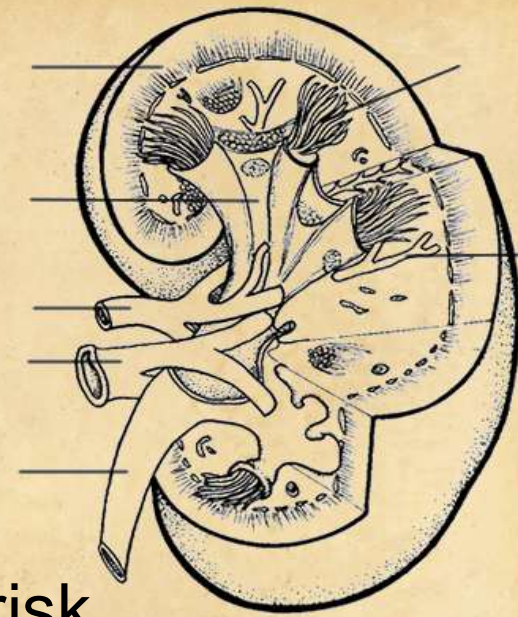


Urine Gram Stain and Culture

- Negative after 48 hours



Acute Pyelonephritis



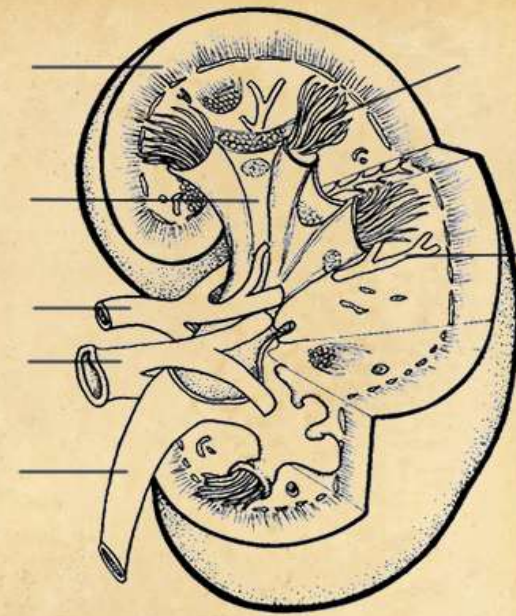
○ Pyelonephritis

- Should be suspected in patients with risk factors including **diabetes**
- Common manifestations:
 - **Fever**
 - Back or **abdominal pain**
 - **Costovertebral angle or flank tenderness**

KUB Ultrasound

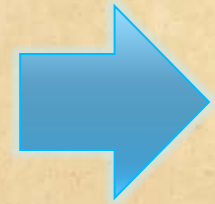
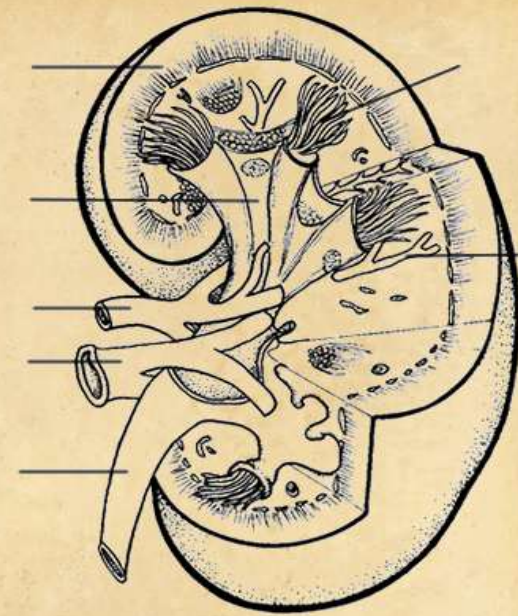
12.05 HD3

- The **right kidney is enlarged** (129.3 x 59.6 x 58.7 mm, renal parenchymal thickness of 17.1 mm)
- The left kidney is normal in size (118.6 x 68.2 x 58.8 mm, renal parenchymal thickness of 16.6 mm).
- Both kidneys exhibit regular marginal outline and homogenous echopattern. Parenchymal echogenicity is within normal limits. Corticomedullary junction is distinct. A prominent column of Berthin is seen at the middle pole of the left kidney.



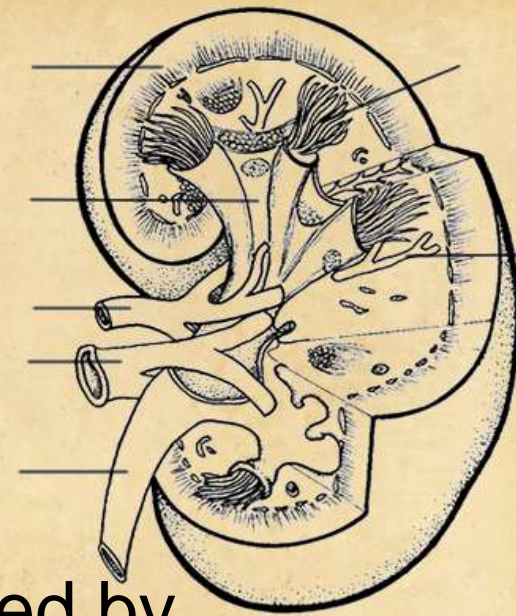
Acute Kidney Injury

- Decrease in appetite
- Poor oral intake
- Dry oral mucosa
- Serum creatinine of 314 $\mu\text{mol/L}$



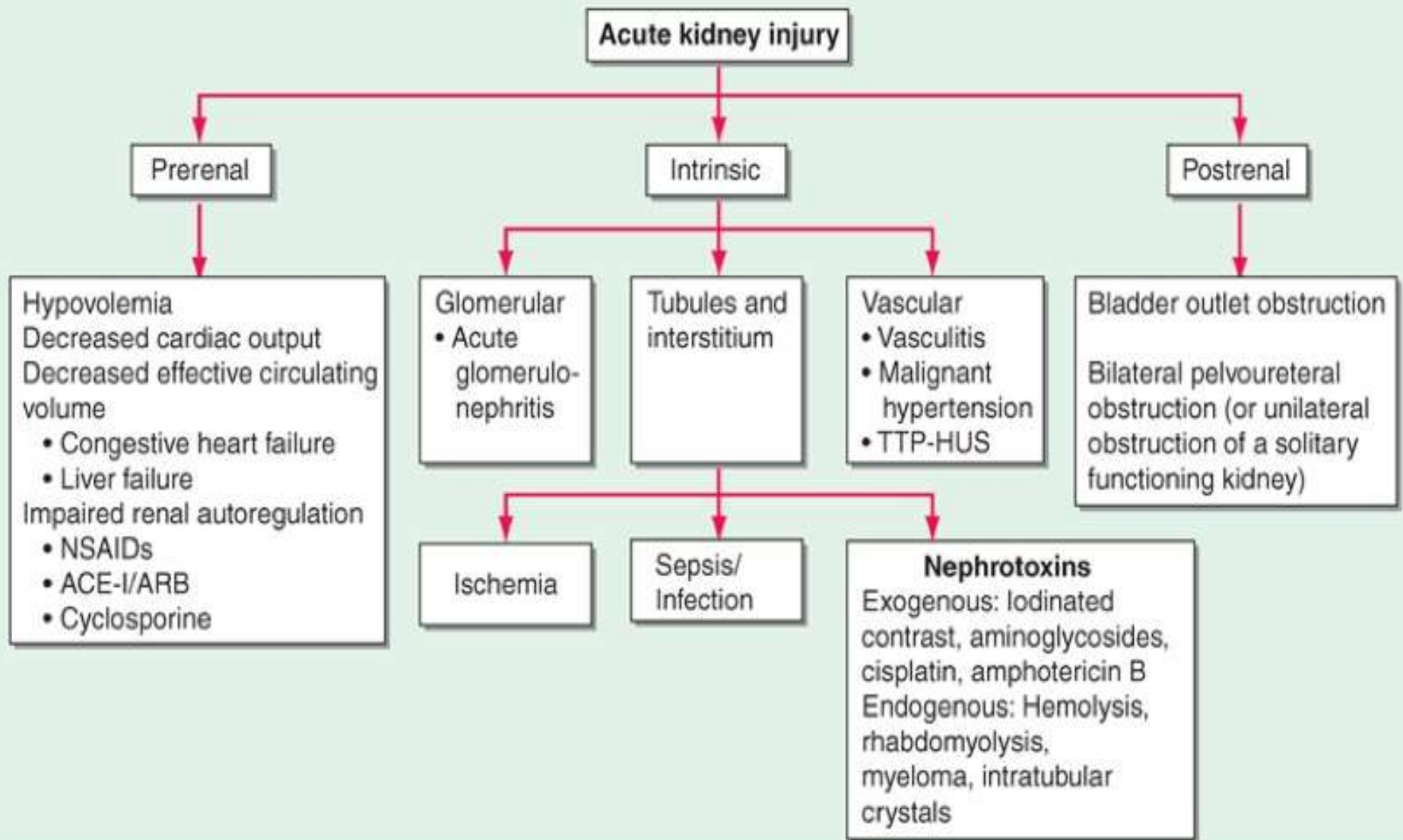
Acute Kidney Injury

- Sudden in onset
 - In a span of hours to days
- Leads to retention of products cleared by the kidneys
- Pertains to a group of conditions with the following common features:
 - Increase in BUN
 - Increase in serum creatinine
 - Decrease in urine volume



Harrison's Principles of Internal Medicine (17th ed.)

Harrison's Principles of Internal Medicine (18th ed.)



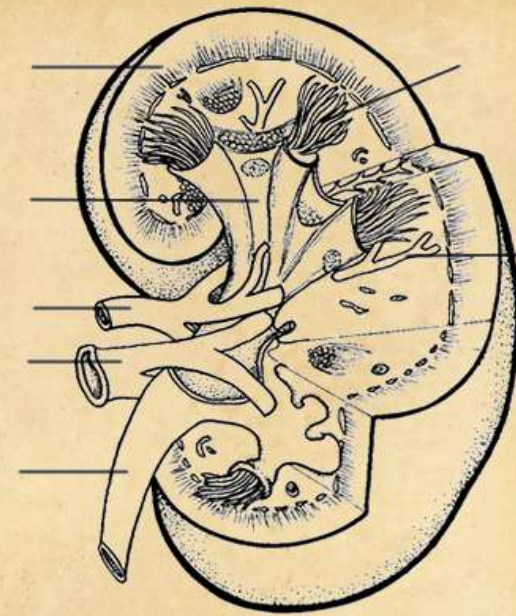
Source: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine, 18th Edition*; www.accessmedicine.com

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Classification of the major causes of acute kidney injury. ACE-1, angiotensin-converting enzyme 1; ARB, angiotensin receptor blocker; NSAIDs, nonsteroidal anti-inflammatory drugs; TTP-HUS, thrombotic thrombocytopenic purpura-hemolytic uremic syndrome.

Urinalysis

Color	Yellow
Turbidity	Cloudy
Reaction	Acidic
Specific Gravity	1.015
Protein	Negative
Sugar	Trace
RBC	3-5/hpf
WBC	Many
Casts	None
Bacteria	Few
Epithelial cells	None
Mucus Threads	None
Crystals	None
Yeast Cells	None

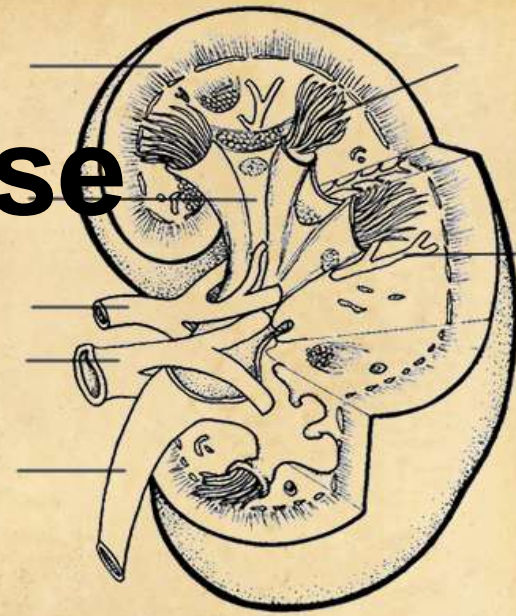


Serum Electrolytes and Chemistries

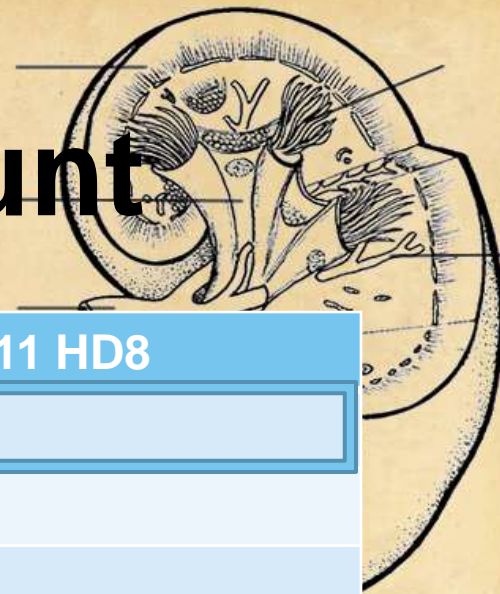
Panels	12.03 DOA	12.04 HD2	12.05 HD3	12.06 HD4	12.08 HD6	12.10 HD8
BUN		15.4				
Creatinine	314 →	761	718	565	679	633
ECC 65kg	17.2 ml/min	7.58 ml/min	9.45 ml/min	10.03 ml/min	10.01 ml/min	9.23 ml/min

Chronic Kidney Disease

- Diabetic and hypertensive
 - Poor compliance to medications
- Older age

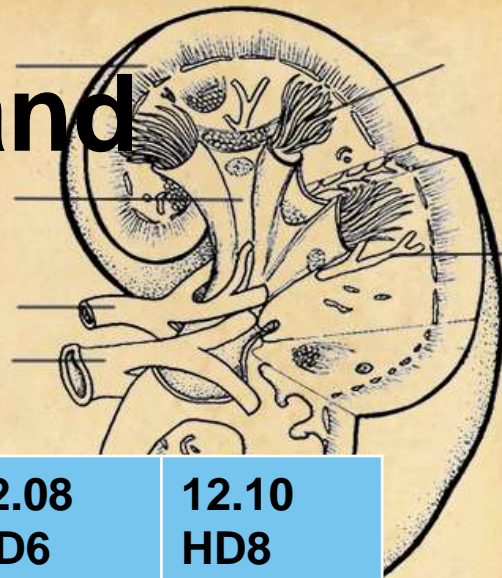


Complete Blood Count



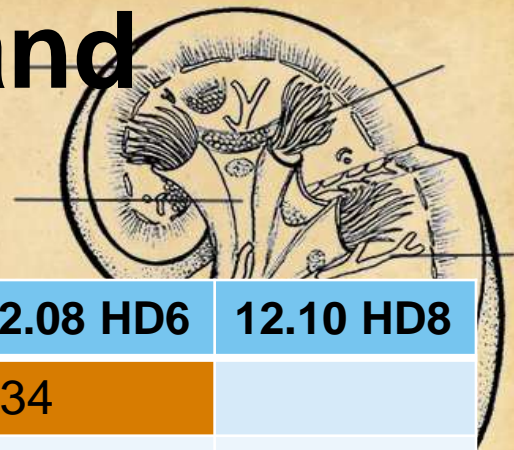
Panels	12.04.11 HD2	12.10.11 HD8
Hemoglobin	102	96
Hematocrit	29	28
RBC	3.7	3.4
WBC	15.2	10.9
Neutrophils	94	67
Lymphocytes	5	28
Monocytes	1	
Eosinophils		4
Basophils		1
Platelets	681	Slightly increased
Remarks	Slightly hypochromic, normocytic	Slightly hypochromic, normocytic

Serum Electrolytes and Chemistries



Panels	12.03 DOA	12.04 HD2	12.05 HD3	12.06 HD4	12.08 HD6	12.10 HD8
BUN		15.4				
Creatinine	314 →	761	718	565	679	633
ECC 65kg	17.2 ml/min	7.58 ml/min	9.45 ml/min	10.03 ml/min	10.01 ml/min	9.23 ml/min

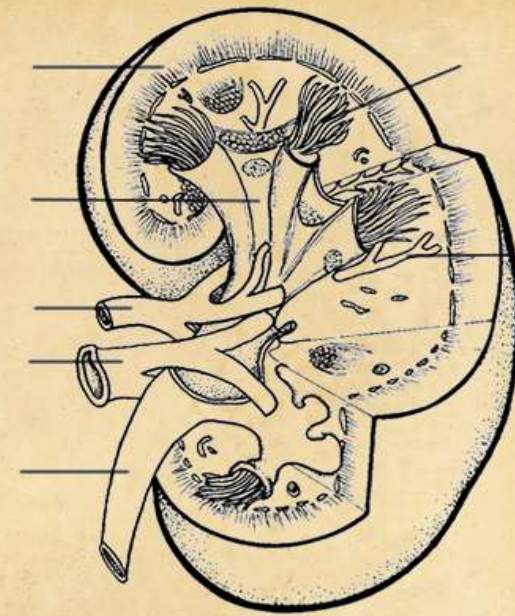
Serum Electrolytes and Chemistries



Panels	12.04 HD2	12.05 HD3	12.06 HD4	12.08 HD6	12.10 HD8
Sodium	129	132	136	134	
Potassium	5.6	5.7	4.3	4.7	
Chloride	99				
Calcium			1.6		
Phosphorous			1.7		
HBA1C	12.5				
BUN	15.4				
Uric Acid					418
Creatinine	761	718	565	679	633
ECC 65kg	7.58 ml/min	9.45 ml/min	10.03 ml/min	10.01 ml/min	9.23 ml/min
Random Urine Total Protein /Creatinine Ratio		0.51			

Urinalysis

Color	Yellow
Turbidity	Cloudy
Reaction	Acidic
Specific Gravity	1.015
Protein	Negative
Sugar	Trace
RBC	3-5/hpf
WBC	Many
Casts	None
Bacteria	Few
Epithelial cells	None
Mucus Threads	None
Crystals	None
Yeast Cells	None



Arterial Blood Gas

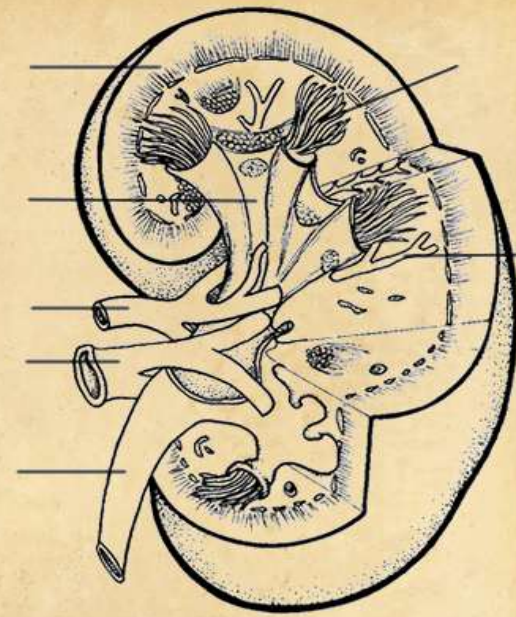
Panels (At Room Air)	12.03.11 HD1
pH	7.33
pCO ₂	25
pO ₂	86
HCO ₃	13.4
Base Excess (ECF)	-12.70
Oxygen Saturation	96%
Total Carbon Dioxide	14.20

**Metabolic acidosis with
adequate oxygenation**

KUB Ultrasound

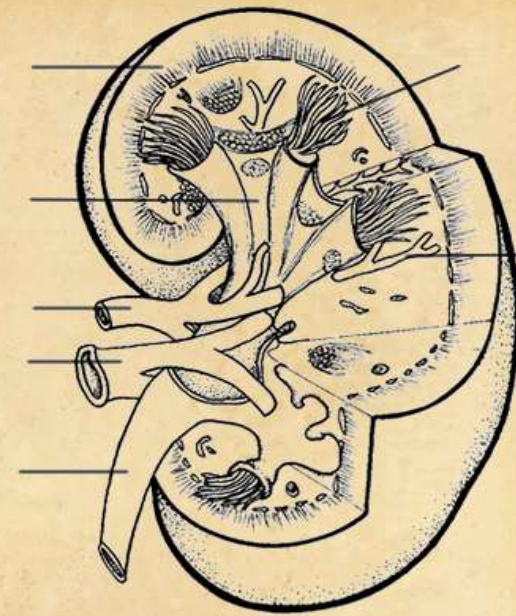
12.05 HD3

- The right kidney is enlarged (129.3 x 59.6 x 58.7 mm, renal parenchymal thickness of 17.1 mm)
- The left kidney is normal in size (118.6 x 68.2 x 58.8 mm, renal parenchymal thickness of 16.6 mm).
- Both kidneys exhibit regular marginal outline and homogenous echopattern. Parenchymal echogenicity is within normal limits. Corticomedullary junction is distinct. A prominent column of Berthin is seen at the middle pole of the left kidney.



Chronic Kidney Disease: Risk Factors

- Hypertension
- Diabetes mellitus
- Autoimmune disease
- Older age
- African Ancestry
- Family history of renal disease
- Previous episode of acute kidney injury
- Presence of proteinuria, abnormal urinary sediment or structural abnormalities of the urinary tract



Chronic Kidney Disease

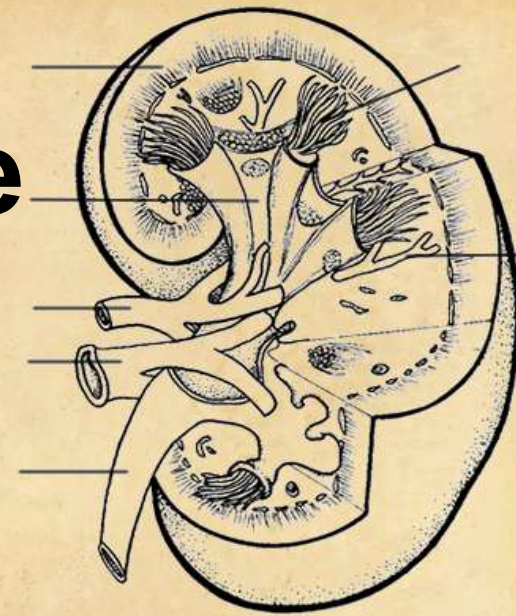
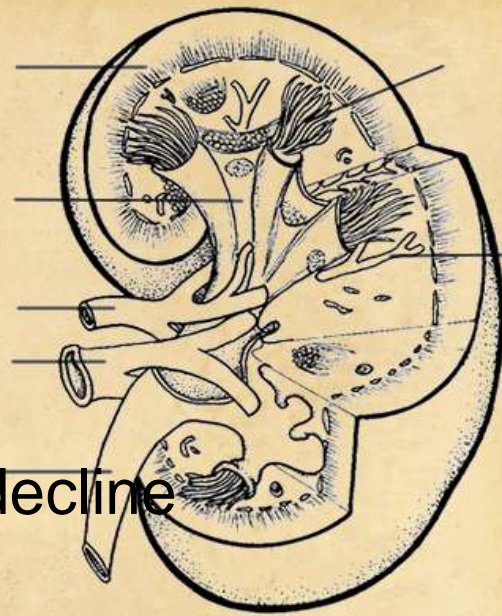


Table 11. Definition of Chronic Kidney Disease
Criteria

1. Kidney damage for ≥ 3 months, as defined by structural or functional abnormalities of the kidney, with or without decreased GFR, manifest by *either*:
 - Pathological abnormalities; or
 - Markers of kidney damage, including abnormalities in the composition of the blood or urine, or abnormalities in imaging tests
2. GFR < 60 mL/min/1.73 m² for ≥ 3 months, with or without kidney damage

Chronic Kidney Disease



○ Stages 1 and 2:

- Usually no associated symptom from the decline in GFR
- Symptoms from the underlying disease may manifest

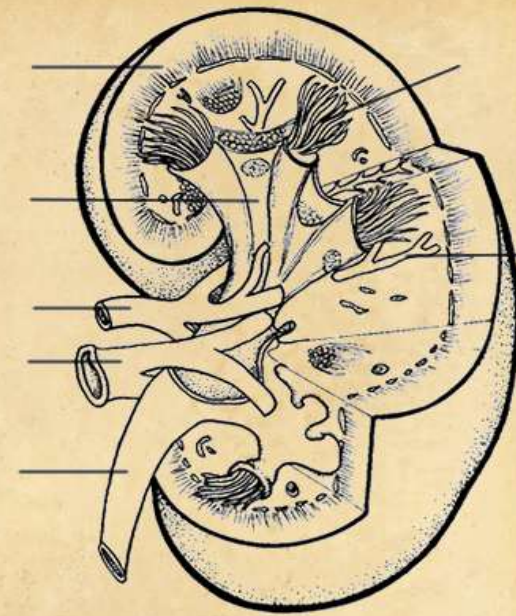
○ Stages 3 and 4:

- Affectation of almost all organ systems
 - Anemia, easy fatigability
 - Decreasing appetite
 - Abnormalities in sodium, potassium, calcium, phosphorus and acid-base homeostasis

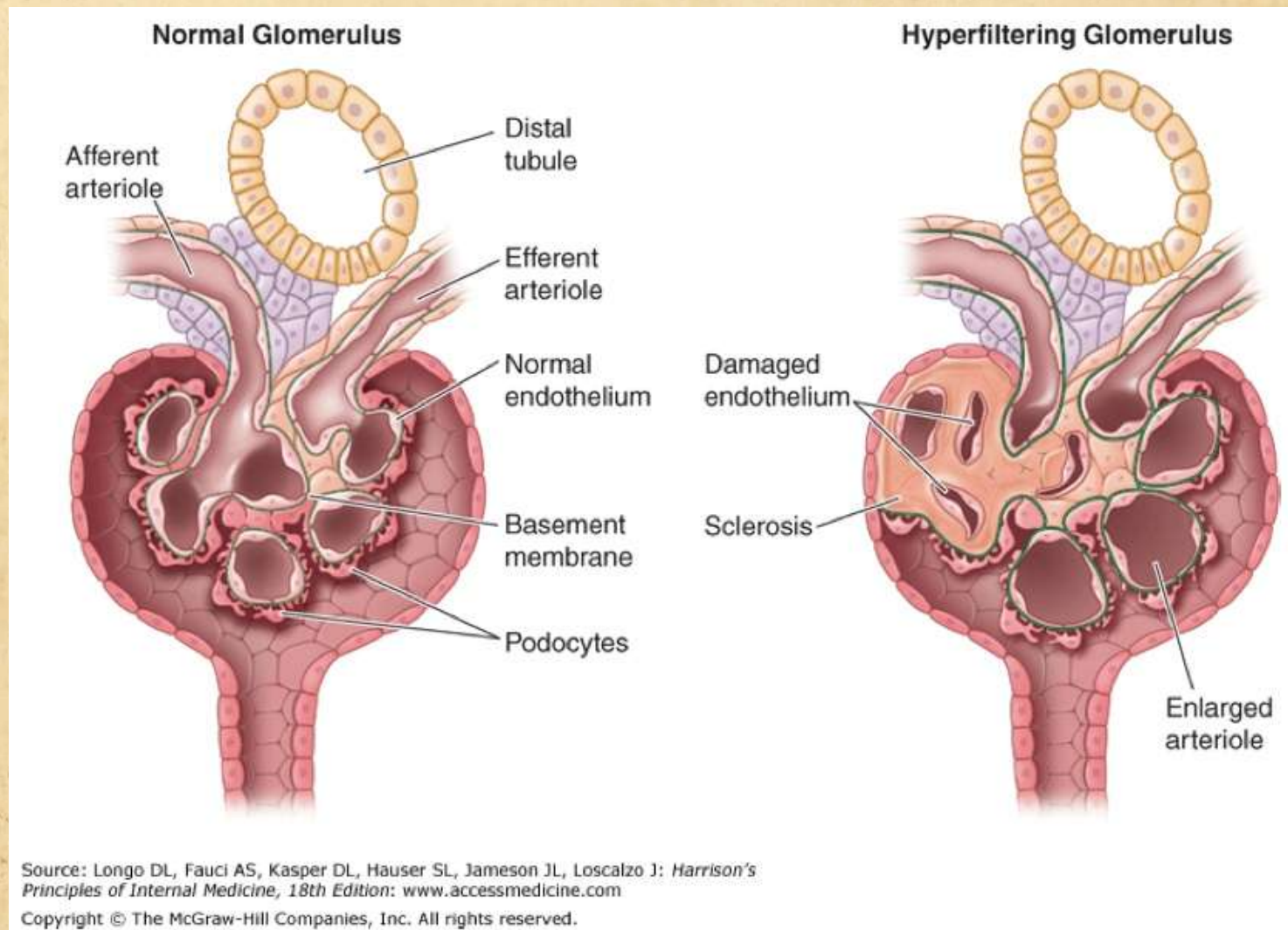
Chronic Kidney Disease

● Stage 5:

- Accumulation of toxins:
 - Uremic syndrome:
 - **Marked disturbance in activities of daily living**
 - Well-being
 - **Nutritional status**
 - **Water and electrolyte balance**

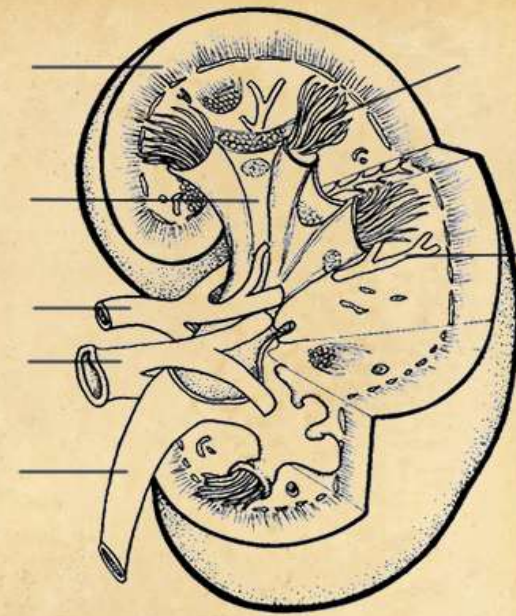


Chronic Kidney Disease: Pathophysiology

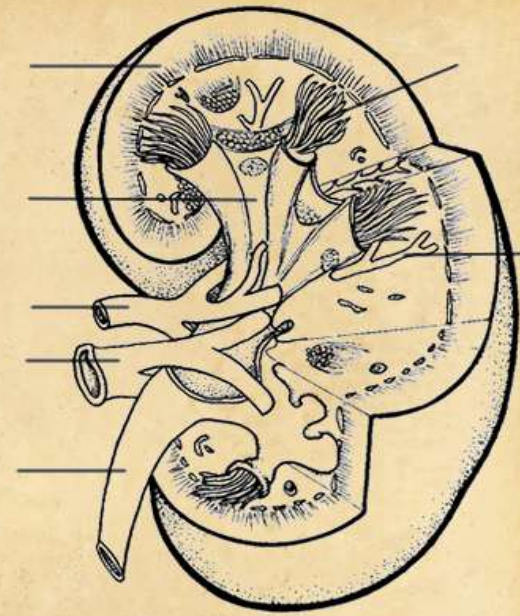


Chronic Kidney Disease: Etiologies

- **Diabetic nephropathy**
- Glomerulonephritis
- **Hypertensive nephropathy**
- Autosomal dominant polycystic kidney disease
- Other cystic and tubulointerstitial nephropathy

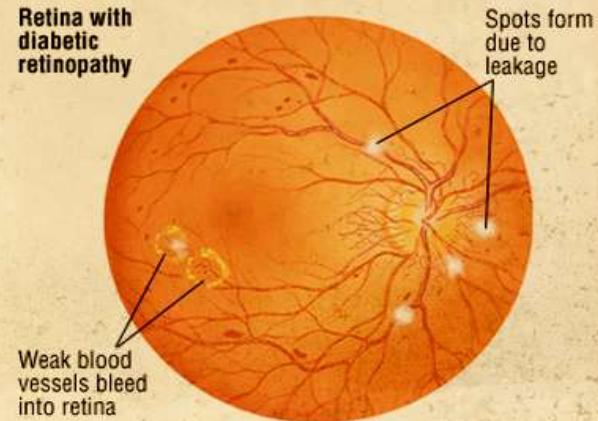


**DM Nephropathy
versus
Hypertensive
Nephrosclerosis**

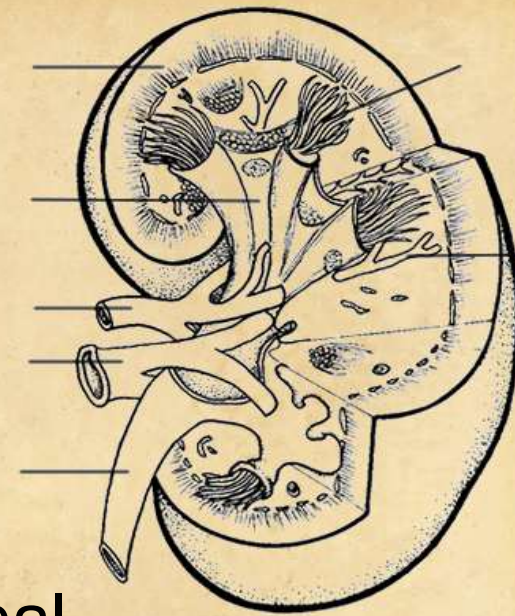


Non-Proliferative Diabetic Retinopathy

- Ophthalmologic Examination:
 - Dull ROR, OU
 - Bilateral lens opacity
 - AV ratio: 1-2:3
 - Cup: disc ratio 0.3-0.4
 - Note of exudates and minimal hemorrhages.



Diabetic Nephropathy: Pathogenesis



- Soluble factors
- Hemodynamic alterations in the renal microcirculation
 - Glomerular hyperperfusion and renal hypertrophy
- Structural changes in the glomerulus
 - Microalbuminuria
 - Macroalbuminuria (may or may not be accompanied by hypertension)

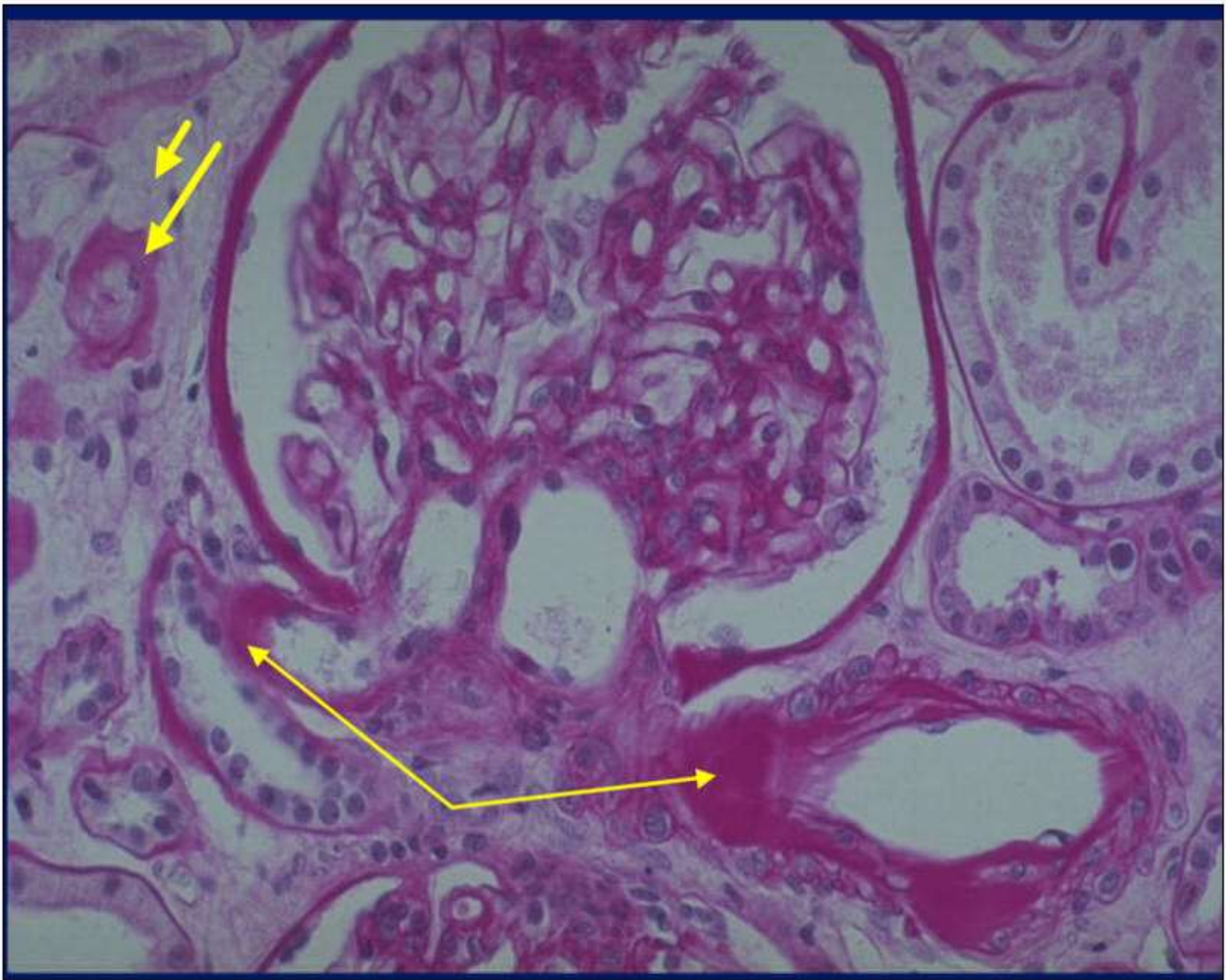
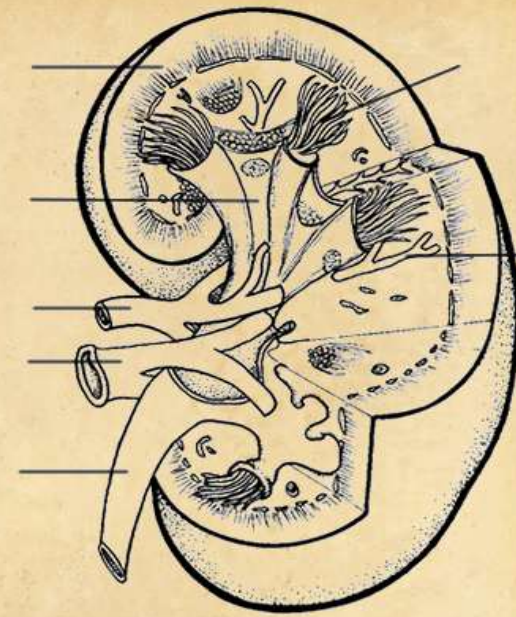


Figure 5
Renal biopsy from a T2DM patient with hyalinosis of the afferent (right thin arrow) and efferent (left thin arrow) glomerular arterioles, interstitial expansion (short thick arrow) and tubular atrophy (long thick arrow). This would be classified as Category III (PAS).

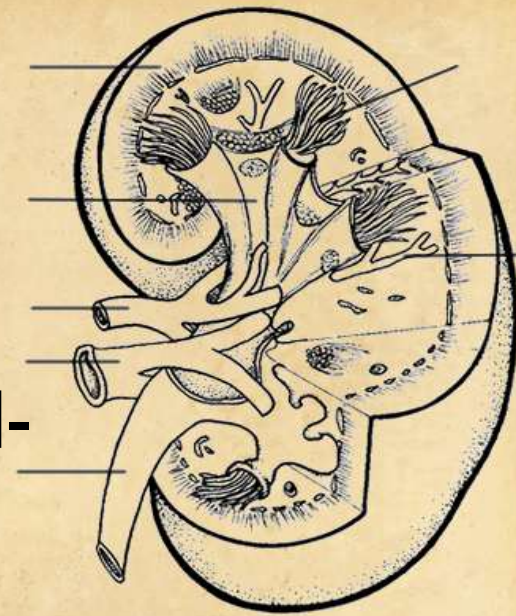
Hypertensive Nephrosclerosis

- A kidney disease that occurs as a result of high blood pressure characterized by damage to the vasculature of the kidney as the blood pressure rises
- Uncontrolled hypertension can cause permanent kidney damage in 6% of patients with elevated blood pressure.



Hypertensive Nephrosclerosis

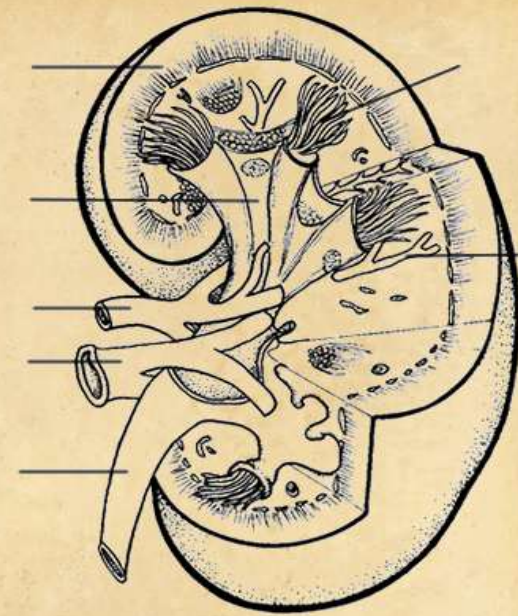
- Risk factors for progression to end-stage kidney disease:
 - Age
 - Sex
 - Race
 - Smoking
 - **Duration of hypertension**
 - Low birth weight



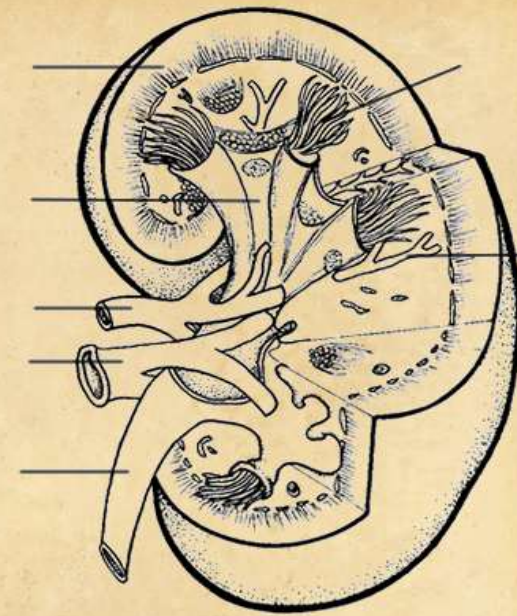
Management of CKD

- Renal replacement therapy
 - Hemodialysis
 - Peritoneal dialysis
 - Renal transplant

- Control blood glucose
 - Maintain pre-prandial glucose at 5.0-7.2 mmol/L or 90-130 mg/dl
 - HbA1c < 7%

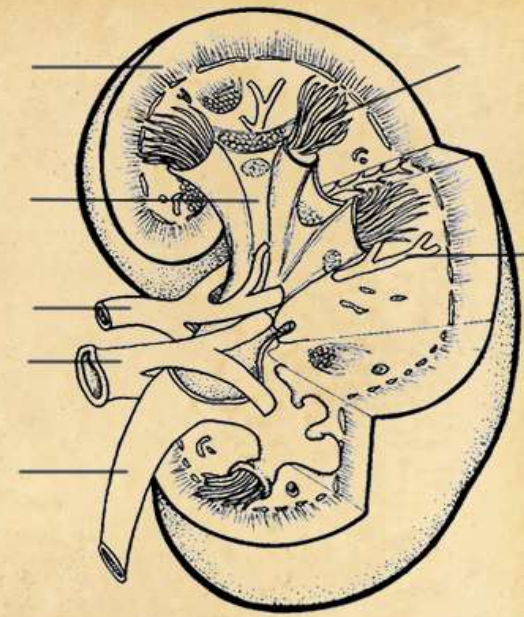


Management of CKD



- Control Blood Pressure
 - Maintain BP <130/80
 - Antihypertensive therapy with ACE I or ARB

- Protein restriction
 - 0.9g/kg/day or 35kCal/kg
 - 0.60-0.75g/kg/day may cause protein-energy malnutrition



Thank you!