

# **Acute Renal Failure**

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# For normal function, kidneys require

- Normal renal blood flow
- Normal glomeruli and tubules
- Clear urinary outflow tract

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# Type of Renal Failure

- **Acute Renal Failure**
  - Sudden Loss of Kidney function
- **Chronic Renal Failure**
  - Long & Slow Progression of Loss of Kidney function
- **End Stage Renal Disease**
  - Complete Loss of Kidney function.

# Acute Renal Failure Definition

- Abrupt fall in GFR
- Over a period of minutes to days
- With rapid & sustained rise in nitrogenous waste products in blood.
  - Creatinine
  - Urea
  - Ammonia
  - Uric Acid

# Cause of ARF

## 1. Pre renal

- Hemodynamic cause

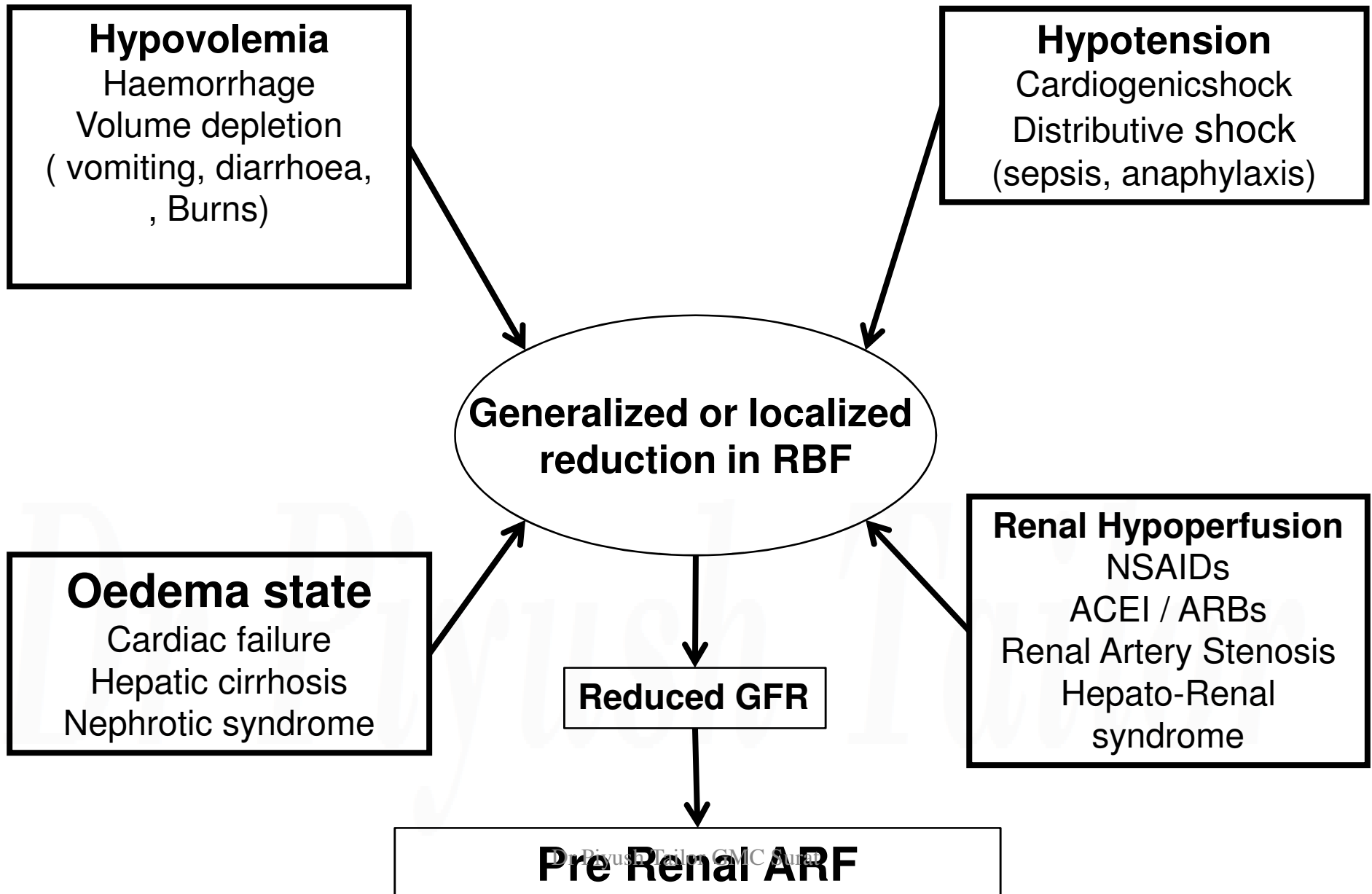
## 2. Renal :

- Acute tubular necrosis
- Acute glomerulonephritis
- Vasculopathy
- Acute interstitial nephritis

## 3. Post renal

- Obstruction cause

# PRE-RENAL (Hemodynamic) ARF



# Renal cause of ARF

## 1. Acute Interstitial nephritis

- Drug – Antibiotic induced
  - NSAIDs, ACEI, Antibiotics ( Streptomycin, Amikacin)
- Radio-contrast dye
- Post-infective, Pyelonephritis

## 2. Vascular occlusion

- Renal vein thrombosis
- Cholesterol plaque

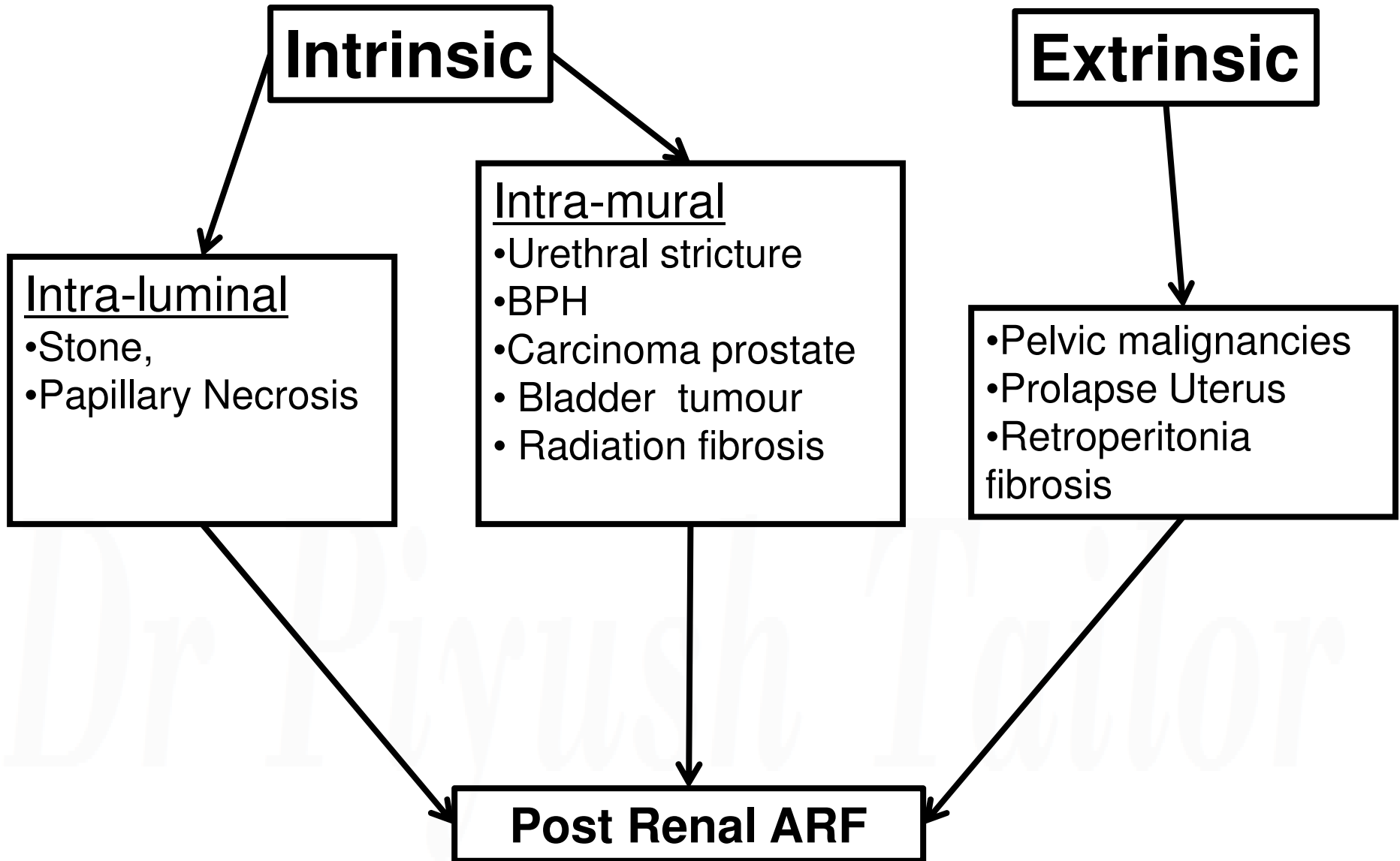
## 3. Acute Glomerular Nephritis

- Post-infectious
- Systemic Lupus Erythematus

## 4. Acute Tubular Necrosis

- Ischemia
- Toxins

# Post Renal - Urinary outflow tract obstruction

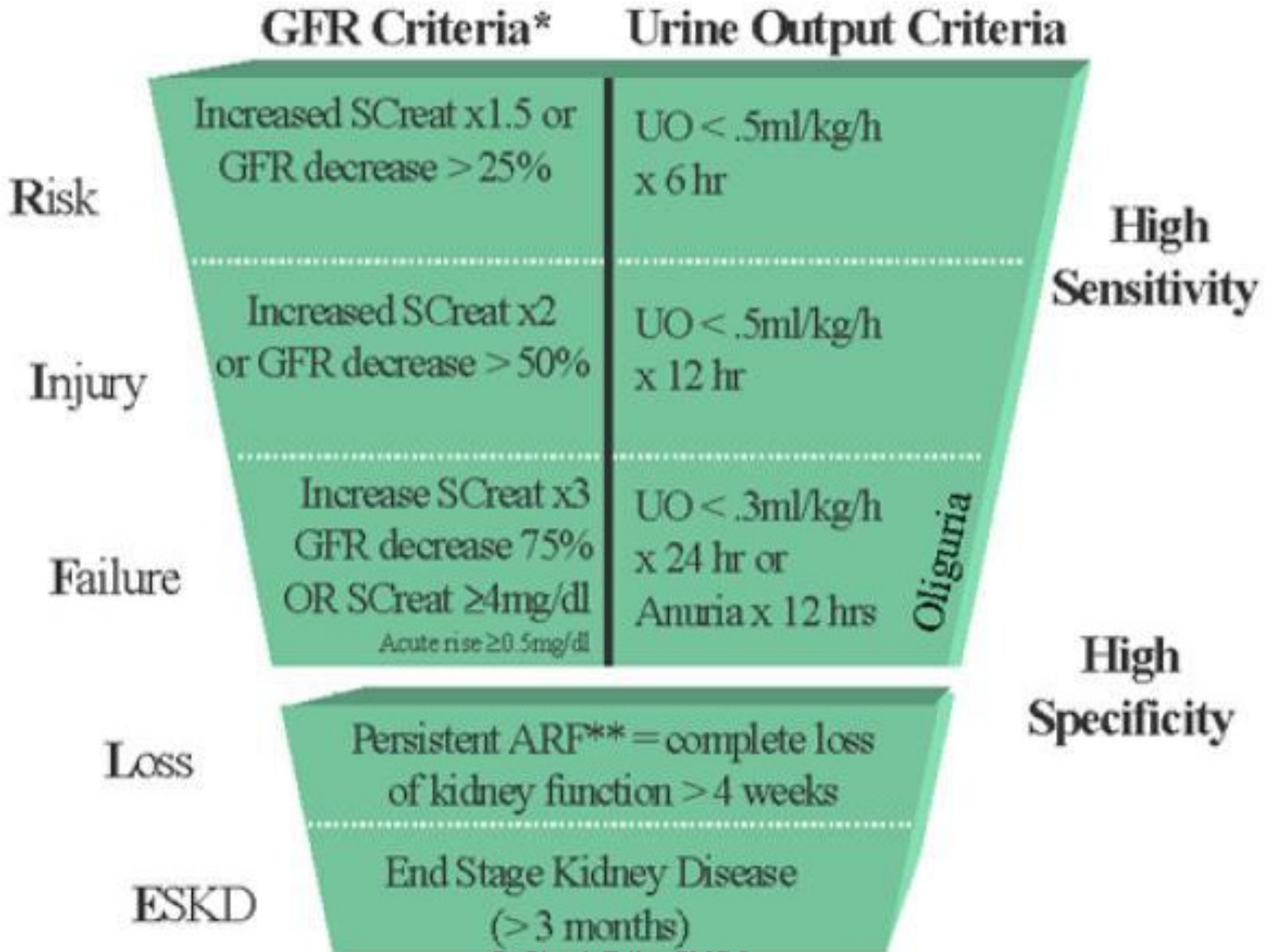




# **ARF Signs and Symptoms**

- **Oliguria**
- **Edema**
  - **Facial edema**
  - **Pedal edema**
  - **Pulmonary edema**
- **Hypertension**
- **Flank pain**
  - associated with renal artery or vein obstruction
- **Encephalopathy**
  - **Headache, dizziness, confusion, seizure**
- **Fever**
- **Respiratory Distress**
  - **Tachypania**

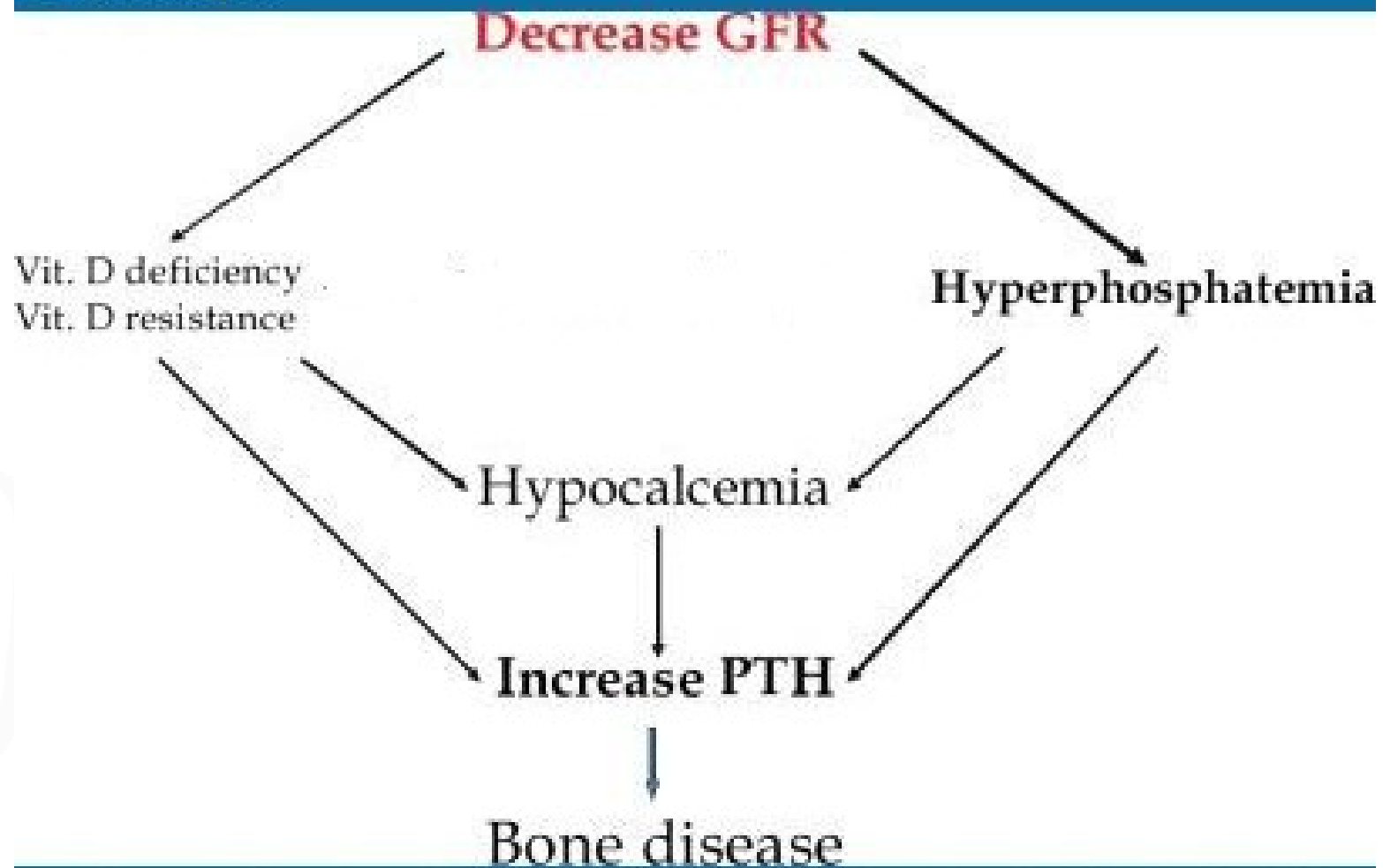
# RIFLE Criteria



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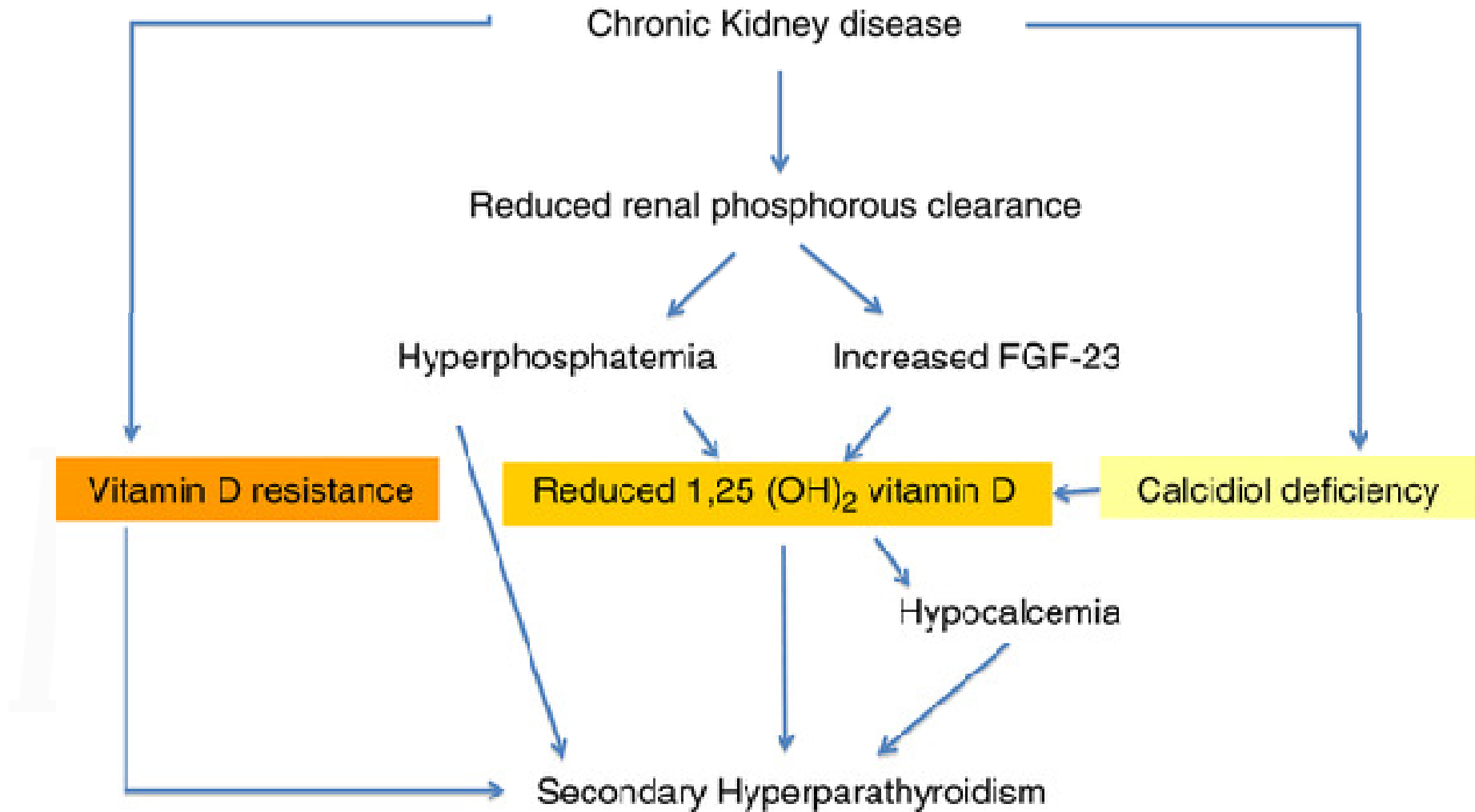
# Calcium Homeostasis Changes In CRF

Medscape



Source: J Am Board Fam Med © 2009 American Board of Family Medicine

# Calcium Homeostasis Changes In CRF



# Life threatening consequences of ARF

- Volume overload
- Hyperkalaemia
- Metabolic acidosis
- Encephalopathy
- Uremia
- Platelet dysfunction

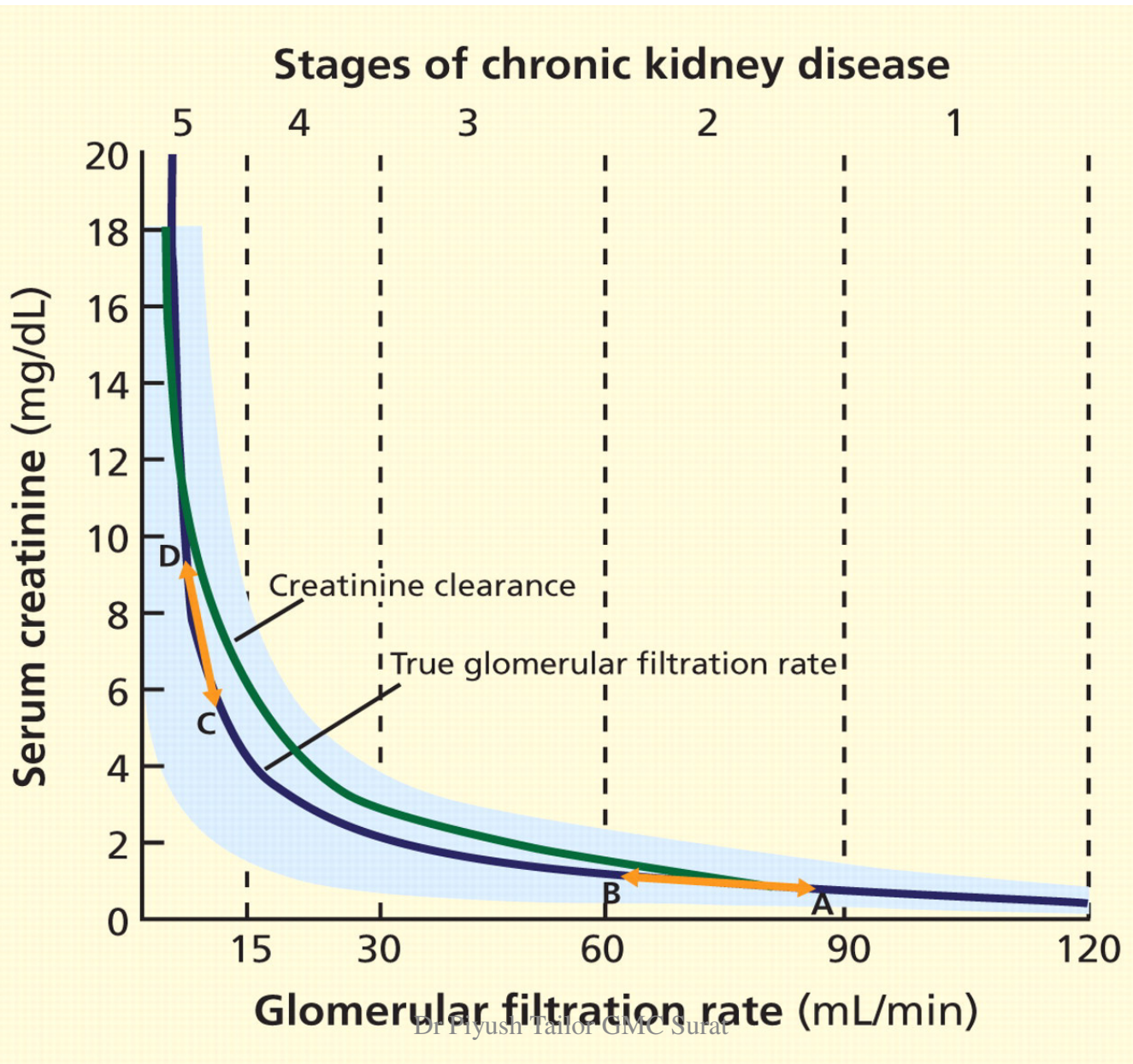
# Factors that suggest chronicity

- Long Duration of symptoms
- Nocturia
- Absence of Acute illness
- Anemia
- Hyperphosphatemia
- Hypocalcaemia
- High Parathyroid hormone

# Clinical markers of ARF

- Reduced GFR
- Raised Serum Creatinine
- Serum Creatinine is poor marker of renal function.
- Poor correlation between Serum Creatinine and level of GFR.

# GFR vs Creatinine





**Table 1. Stages of CKD<sup>a</sup>**

<b>Stage</b>	<b>Description</b>	<b>GFR (mL/min/1.73 m<sup>2</sup>)</b>
1	Kidney damage with normal or GFR	≥ 90
2	Kidney damage with mild GFR	89-60
3A	Mild to moderate GFR	59-45
3B	Moderate GFR	45-30
4	Severe GFR	30-15
5	Kidney failure	< 15 or dialysis

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

<sup>a</sup>Adapted from the Renal Association. <http://www.renal.org/whatwedo/InformationResources/CKDeGUIDE/CKDstages.aspx>. Accessed November 16, 2013.

# Biochemistry

- ✓ Blood urea
- ✓ Serum Creatinine
- ✓ Blood Electrolytes
  - Potassium = Hyperkalemia
  - Calcium = Hypocalcemia
  - Phosphate = Hyperphosphatemia
- ✓ Serum bicarbonate
- ✓ FBS, PP2BS
- ✓ Serum Total protein & Albumin
- ✓ Blood gas analysis –
  - ✓ Metabolic acidosis
- ✓ Urinary examination

# Haematology

- ✓ Complete blood count
  - Eosinophilia
  - Thrombocytopenia
- ✓ Coagulation study
  - Disseminated intravascular coagulation

# Immunology

- ✓ Antinuclear antibody (ANA)
- ✓ Anti-double stranded (ds) antibody
- ✓ C3 & C4 complement concentrations
- ✓ ASO and anti-DNAse titres
- ✓ AntiGBM (Glomerular Basement Membrane) Antibodies

# **Serology**

- ✓ Hepatitis B and C, HIV serology

# **Radiology**

- ✓ Renal ultrasonography
  - For renal size
  - Symmetry
  - Evidence of obstruction

# Management principles in ARF

- Identify & correct pre-renal and post-renal factors
- Optimise cardiac output and RBF
- Stop drugs ACEI, ARB, NSAID
- Monitor fluid balance and daily body weight
- Maintaining calories requirement
- Maintaining Protein intake
- Identify and treat acute complications
  - Hyperkalaemia
  - Metabolic Acidosis
  - Pulmonary oedema

# Management

- **Maintain Volume homeostasis**
  - ✓ Hypovolemia = 1 – 1.5 ml/kg/hour IV normal saline
  - ✓ Hypervolemia = Diuretics = Furosemide
- **Correction of Biochemistry parameter**
  - ✓ Metabolic Acidosis
  - ✓ Hyperkalemia
  - ✓ Uremia
- **Vasodilator = Dopamine = Improve Renal flow**
- **Dietary**
  - ✓ Salt & Fluid
  - ✓ Potassium and Phosphorus
  - ✓ Protein

## **Indication Of Dialysis**

- **Hyperkalemia**
- **Volume overload**
- **K<sup>+</sup> > 6.5 mmol/l**
- **PH < 7.0**
- **Urine output < 200 ml in 12 hours**
- **Anuria < 50 ml in 12 hours**
- **Azotemia BUN > 70 mg%**
- **Toxic removal**
- **Drug Over dose**
- **Uremicencephalopathy**
- **Pericarditis**

# Prophylactic Strategies for Radio-contrast

- Use I.V. contrast only when necessary
- Hydration with normal saline (1-1.5 mL/Kg/ h) 6 -12 h before and after the procedure.
- Minimize contrast volume
- N-acetylcysteine
  - 600-1200 mg BID
  - For 1 day before and 1 day after procedure