



**SNS COLLEGE OF ALLIED HEALTH SCIENCES**  
SNS Kalvi Nagar, Coimbatore - 35  
Affiliated to Dr MGR Medical University, Chennai



**DEPARTMENT OF CARDIOPULMONARY PERFUSION CARE**  
**TECHNOLOGY**

**COURSE NAME: PATHOLOGY II**

**II YEAR**

**UNIT III : PATHOLOGY OF KIDNEY**

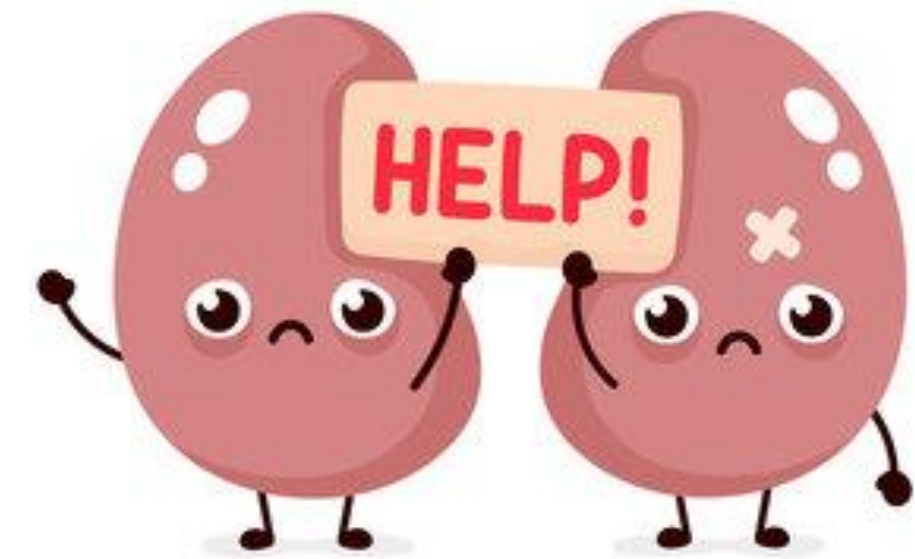
**TOPIC 2 : ACUTE KIDNEY FAILURE (AKF)**



# Acute Kidney Failure



Acute renal failure (ARF) is a syndrome characterised by rapid onset of *renal dysfunction*, chiefly oliguria or anuria, and sudden increase in metabolic waste-products (urea and creatinine) in the blood with consequent development of uraemia.



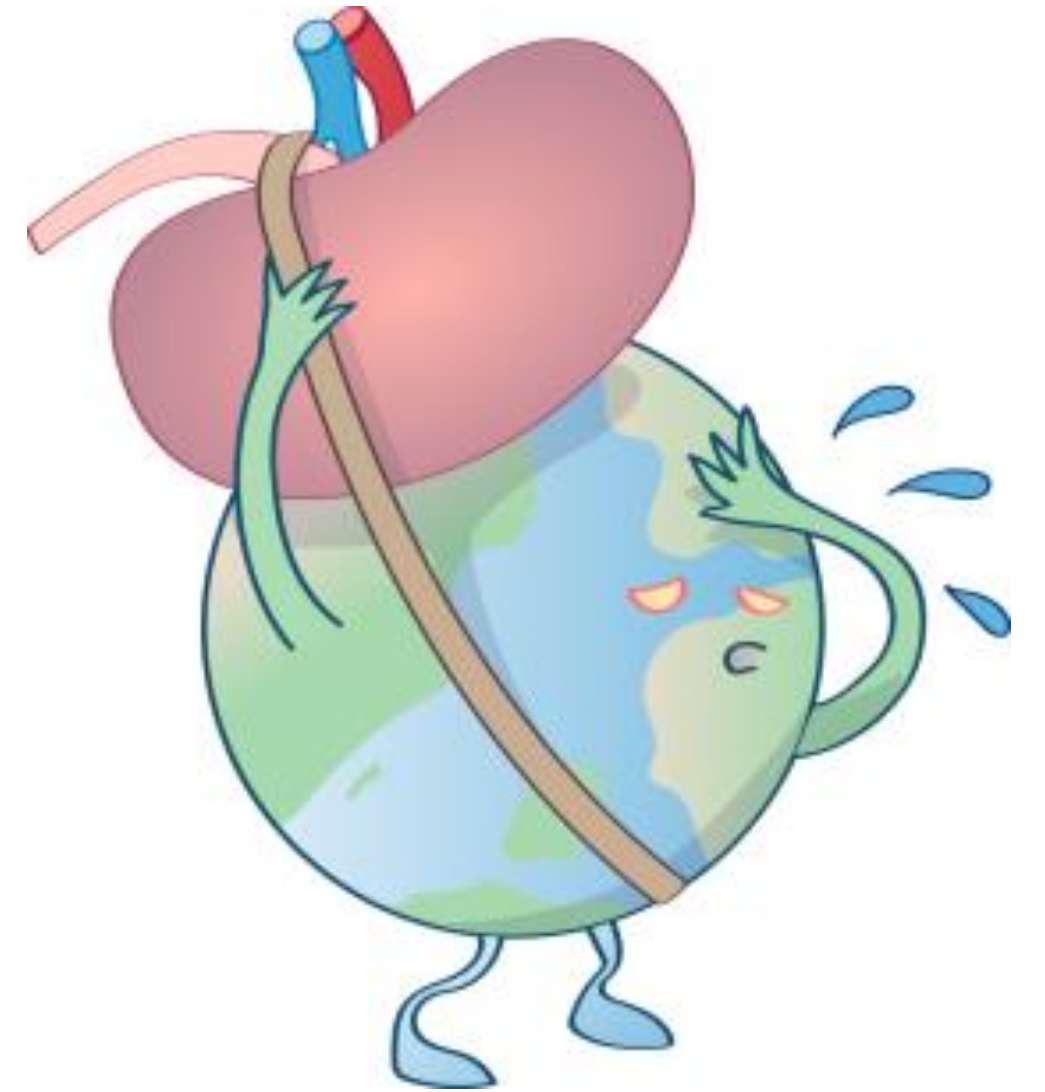


# Epidemiology



It occurs in

- – 5% of all hospitalized patients
- – 35% of those in intensive care units
- Mortality is high - up to 75–90% in patients with sepsis





# Etiopathogenesis



## ***Pre-renal causes***

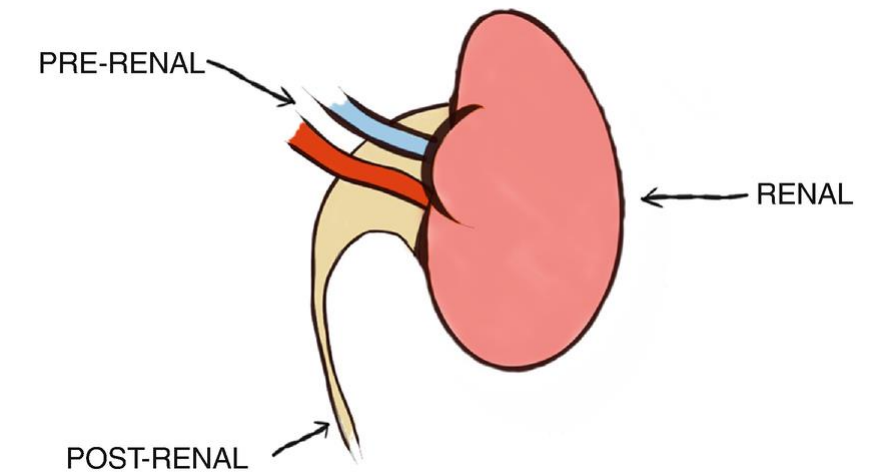
- Sudden decrease in blood flow to the nephron (**renal ischemia**)
- The causes include inadequate cardiac output and hypovolaemia or vascular disease causing reduced perfusion of the kidneys

## ***Volume depletion***

- *Renal loss – diuretics*
- *GI Loss – vomiting, diarrhoea*
- *Cutaneous Loss – burns*
- *Haemorrhage*

## ***Decreased Cardiac Output***

- *Heart Failure*
- *Pulmonary Embolus*
- *MI*
- *Severe valvular disease*
- *Abdominal compartment syndrome (ascites)*



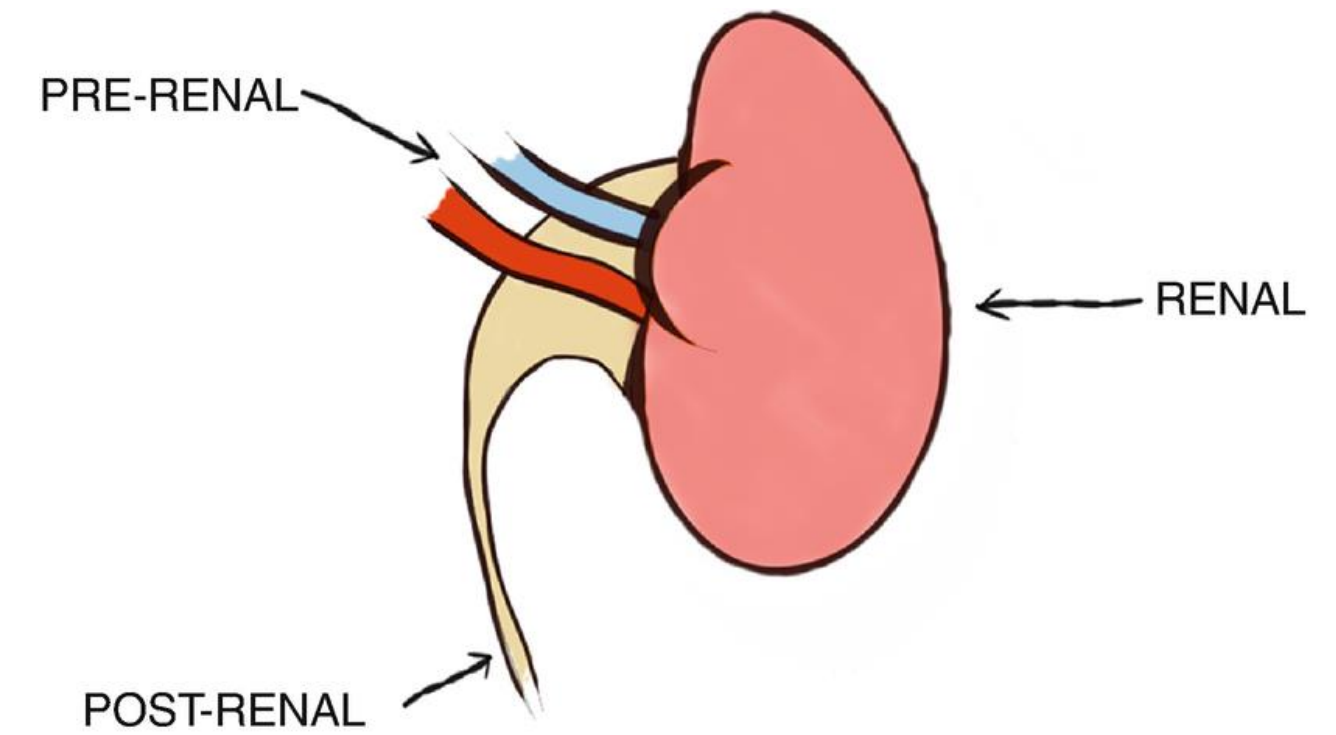


# Etiopathogenesis



## ***Intra-renal causes***

- Disease of renal tissue itself
- Vascular disease of the arteries and arterioles within the kidney, diseases of glomeruli, acute tubular necrosis
- Toxins, including chemicals, illegal drugs, and even some prescribed medications, have to pass through the kidneys and can damage them.



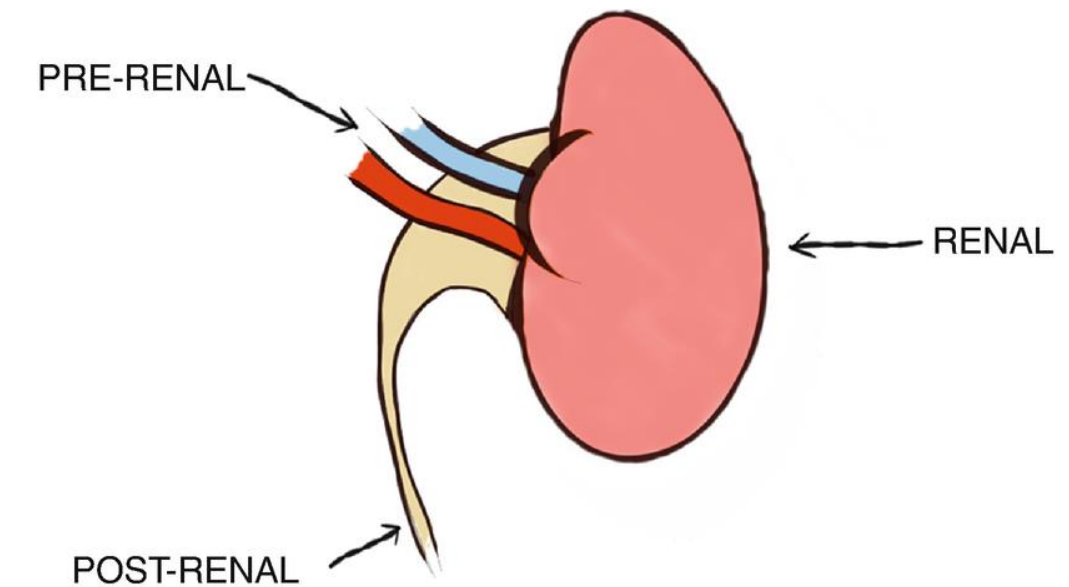


# Etiopathogenesis



***Post-renal causes*** - obstruction to the flow of urine

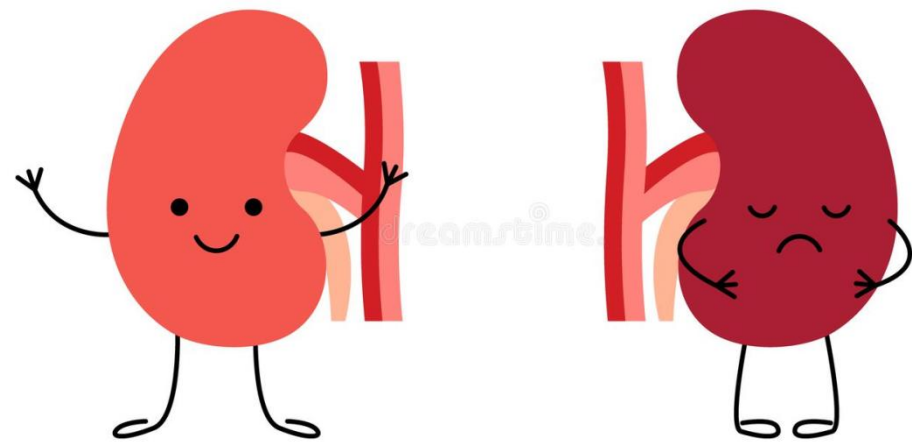
- It is caused by a mass within the lumen or external compression
- ***Uretic obstruction*** – stone, tumor, fibrosis
- ***Bladder neck obstruction*** – Benign Prostatic Hypertrophy (BPH), Bladder tumor, Neurogenic Bladder
- ***Urethral obstruction*** – strictures, tumor





# Pathophysiology

Decrease renal blood flow



↓  
Lowers GFR

↓  
Decrease clearance of metabolites

This form of ARF is reversible, but if the ischemia occurs for a long period, that leads to **Acute Tubular Necrosis (ATN)**

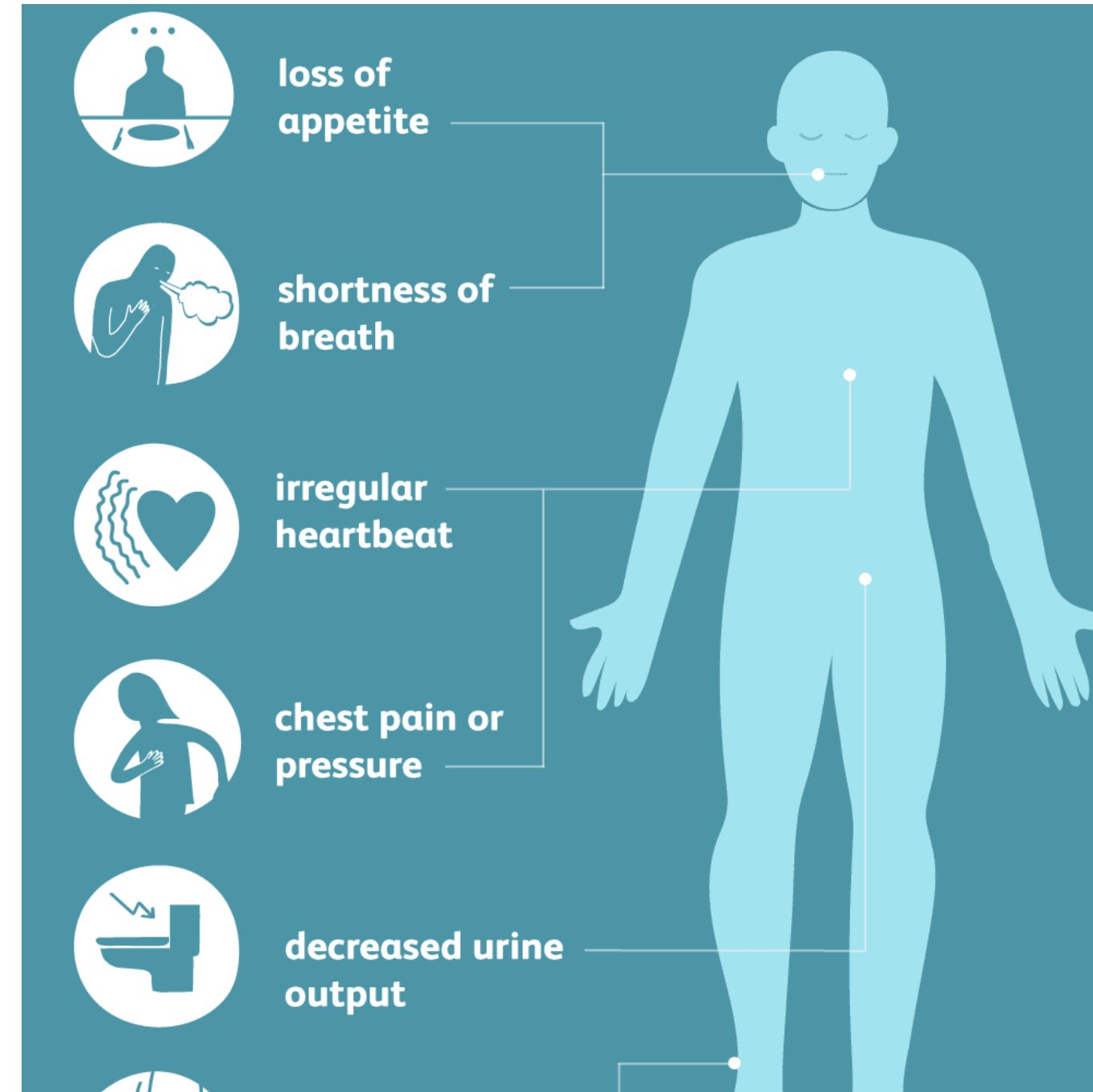
# Clinical Features

## *Asymptomatic effects*

- Elevations in the plasma creatinine
- Abnormalities on urine analysis

## *Symptomatic effects*

- Weakness, fever, Edema
- Anorexia
- Seizures
- Flank pain
- Hypertension
- No urine output or Discoloured Urine







# Acute tubular necrosis (ATN)



- ARF is caused by destruction of the tubular cells of the nephron as occurs in acute tubular necrosis

## 3 characteristic stages

### *Oliguric phase*

- *Lasts for 7 to 10 days*, characterized with urine output of less than 400 ml per day
- The specific gravity of the urine is low but the concentration of sodium in urine tends to be elevated
- Elevated metabolic waste -----> azotaemia



# Acute tubular necrosis (ATN)



## *Diuretic phase*

- Onset of healing of tubules
- Improvement in urine output occurs
- Occurs due to drawing of water and sodium by preceding high levels of creatinine and urea
- The urine is of low or fixed specific gravity.

## *Phase of recovery*

- Full recovery with healing of tubular epithelial cells occurs in about half the cases, while others terminate in death.
- The process of healing may take up to one year with restoration of normal tubular function.



# Complications of AKI



ECF Expansion -----> pulmonary edema (treat with diuretic furosemide)

Metabolic effects

- *Hyperkalemia* – decreased excretion of  $K^+$
- *Metabolic acidosis* – decreased excretion of  $H^+$  ions
- *Hypocalcemia* - loss of ability to form active Vitamin D
- *Hyponatremia* – if water intake is greater than loss
- *Uremia* - Toxic end products of metabolism accumulation
- *Infection* - pneumonia , UTI ,wound infection ,and sepsis





# Diagnosis



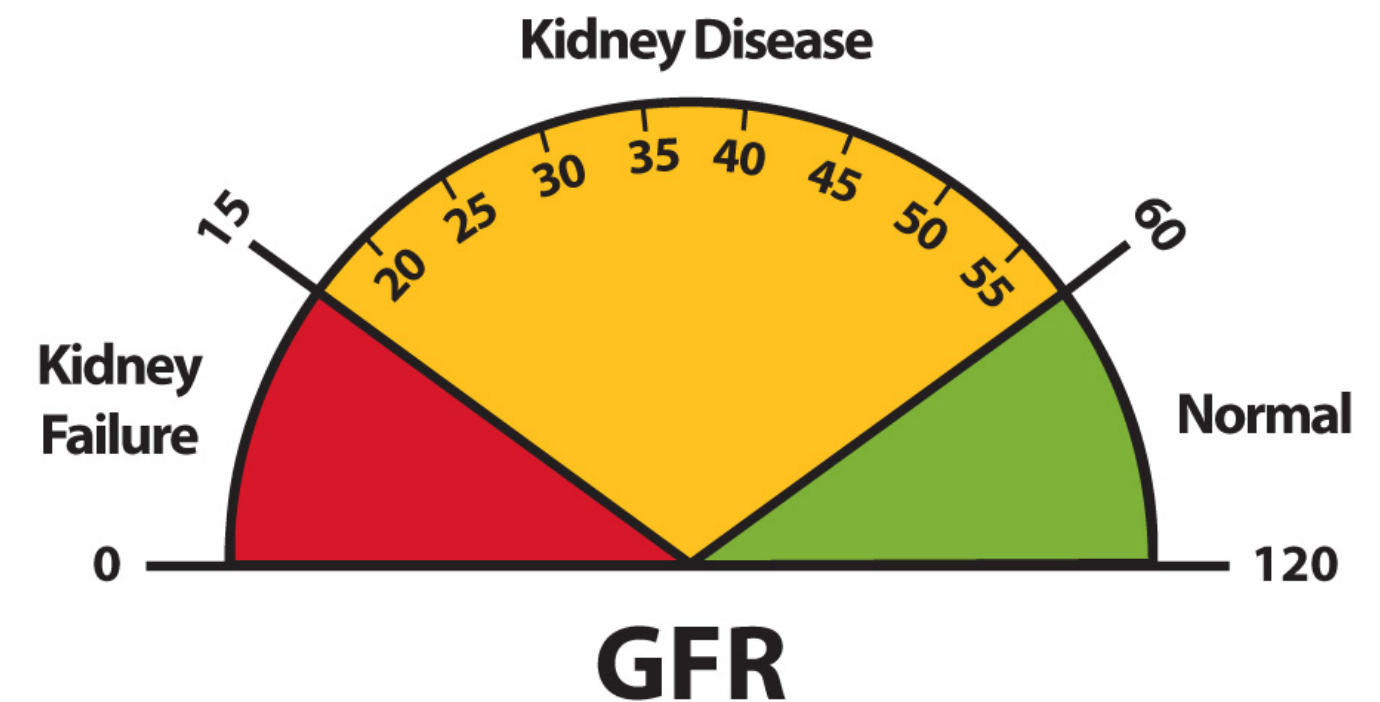
- If the serum creatinine (a blood test that measures kidney function) rises by **.3 mg/dl**
- If the serum creatinine **rises by 50 percent or more** from normal levels
- If the urine output falls to **.5 milliliters per kilogram of body weight per hour** for more than six hours

## Normal urine output

**Adult** - 0.5 to 1 milliliter per hour per kilogram of body weight

**Children** - approx. 1 milliliter per hour per kilogram

**Infants** - 2 milliliters per hour per kilogram of body weight





# Treatment



- Intravenous (IV) fluids
- Electrolyte management
- Stopping the use of toxins
- Optimize cardiac output. BP should be approximately 120 to 140 / 80 to 90
- Dialysis



# THANK YOU



## References:

- Text book of Pathology Harsh Mohan
- Textbook of Pathology for Allied Health Sciences, Ramadas Nayak