

RENAL & URINARY

NURSING STUDY NOTES

Renal and urinary nursing bundle



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STUDY ANYWHERE

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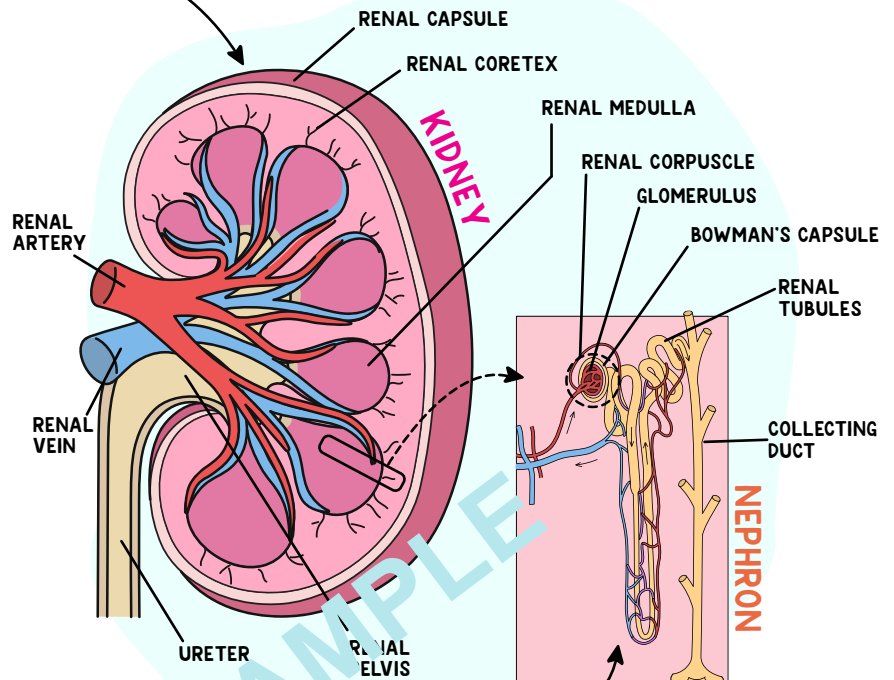
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RENAL SYSTEM OVERVIEW

KIDNEY FUNCTIONS

REMEMBER "A WET BED"

- A** Acid-base balance
- W** Water balance
- E** Electrolyte balance
- T** Toxin removal
- B** Blood pressure control
- E** Erythropoietin production
- D** D metabolism
 ↳ Vitamin D is used for calcium absorption



URINE FORMATION

1 GLOMERULAR FILTRATION

Blood enters through afferent arteriole & is filtered through the glomerulus

AKA GFR

FILTERS 125 ML/ MIN

2 REABSORPTION

Parts of the filtrate is reabsorbed from the renal tubules back to the blood

non-filterable components (proteins & blood cells) exit through efferent arteriole

3 SECRETION

Substances taken out of filtrate to be excreted in the urine

4 EXCRETION

Flow of urine into the urinary tract from the renal pelvis to the urethra

← OCCURS IN NEPHRON

NEPHRON FUNCTIONS

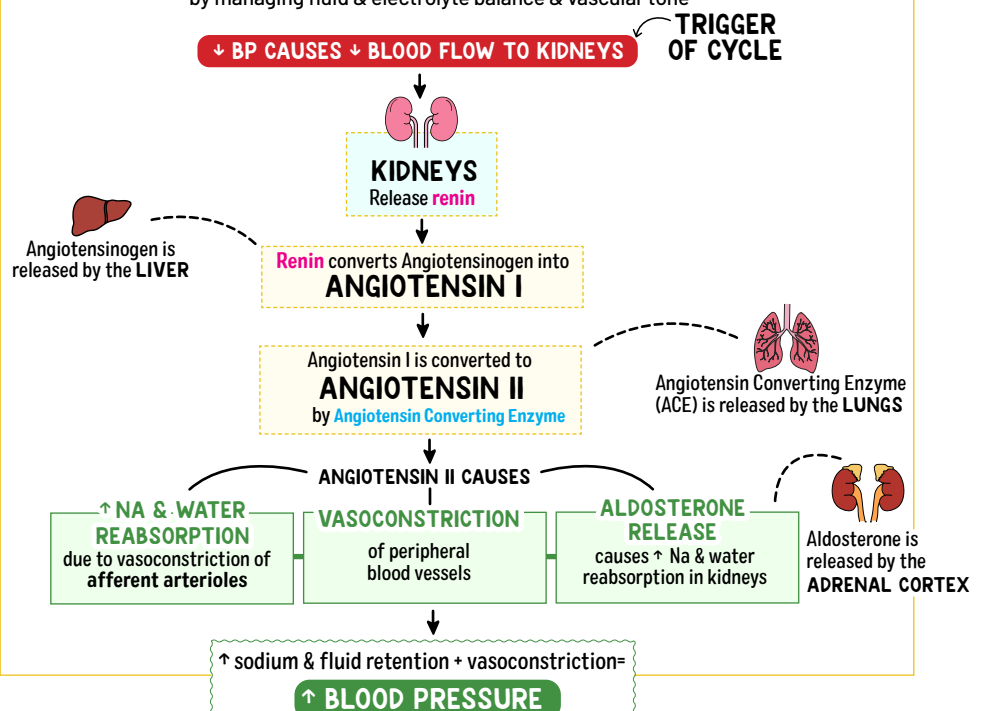
- ① Filters blood (glomerulus)
- ② Reabsorbs minerals & water (renal tubule)
- ③ Secretes waste (renal tubule)
- ④ Produces urine (collecting duct)

THERE ARE ABOUT 1 MILLION NEPHRONS IN EACH KIDNEY!

RAAS

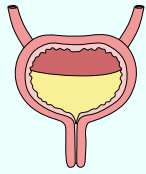
RENIN-ANGIOTENSIN-ALDOSTERONE SYSTEM

Multi-organ feedback mechanism that regulates blood pressure by managing fluid & electrolyte balance & vascular tone



URINARY ASSESSMENT

NORMAL URINE OUTPUT



AT LEAST 30 ML/ HR

Average adult output is
1500 ML/ DAY

NORMAL LAB VALUES

GFR (GLOMERULAR FILTRATION RATE)

How much blood kidneys filter per minute

NORMAL: 90–120 ML/ MIN

KIDNEY DAMAGE: <60 ML/ MIN

KIDNEY FAILURE: <15 ML/ MIN

LOW GFR =
↓ urine output & ↑
toxins in blood

CREATININE

By-product of muscle breakdown

NORMAL: 0.6–1.2 MG/DL

REASONS FOR:

↑ CREATININE

- ▶ AKI or CKD
- ▶ Heart failure
- ▶ Dehydration

↓ CREATININE

- ▶ ↓ protein intake
- ▶ Liver disease
- ▶ ↓ muscle mass

BUN (BLOOD UREA NITROGEN)

By-product of protein metabolism

NORMAL: 6–20 MG/DL

REASONS FOR:

↑ BUN

- ▶ Urine obstruction
- ▶ Dehydration
- ▶ Renal disease

↓ BUN

- ▶ Liver damage
- ▶ Overhydration
- ▶ Malnutrition

URINE COLOR MEANINGS



CLEAR

Overhydrated



PALE YELLOW

Normal



DARK AMBER

Dehydrated



RED/PINK

Blood (hematuria)



ORANGE

Liver damage

Meds (pyridium & rifampin)



GREEN/ BLUE

Bacterial infection

Meds (propofol)

ASSESSMENT TERMS

ANURIA: Output <50 mL per day

OLIGURIA: Output <20 ml/hour or <400 ml/day

HEMATURIA: Blood in urine

PROTEINURIA: Protein in urine

NOCTURIA: Frequent urination at night

DYSURIA: Painful urination

URGENCY: Sudden, strong need to urinate

FREQUENCY: Needing to urinate more often than usual

INCONTINENCE: Loss of bladder control

NORMAL URINE VALUES

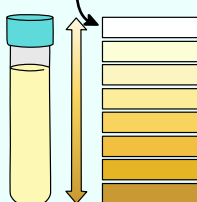
SPECIFIC GRAVITY

Measures concentration of dissolved solutes in urine

NORMAL: 1.005 TO 1.030

LOW= DILUTE

HIGH= CONCENTRATED



The lower the SG, the closer it becomes to water

THE SPECIFIC GRAVITY OF WATER IS 1

URINE OSMOLALITY

▶ Not part of routine urinalysis

▶ More accurate test to measure urine concentration

NORMAL: 300–900 MOSM/KG

<300= DILUTE

>300= CONCENTRATED

PH

Acid-base balance of urine (not the same as blood pH)

NORMAL: 4.6 TO 8

Specific gravity is easily influenced by the size of particles in urine, whereas osmolality focuses solely on the number of particles in urine

ABNORMAL FINDINGS

- + **GLUCOSE:** may indicate ↑ blood glucose
- + **KETONES:** may indicate DKA
- + **PROTEIN:** may indicate kidney disease
- + **BLOOD:** may indicate trauma, UTI, cancer
- + **NITRITES:** may indicate infection
- + **BILIRUBIN:** may indicate liver disease

ACUTE KIDNEY INJURY

WHAT IS IT?

Sudden decline in renal function

ABRUPT BUT REVERSIBLE

Causes build up of waste & fluid and electrolyte imbalances

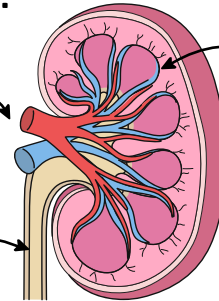
Can lead to **CHRONIC KIDNEY DISEASE** which is **IRREVERSIBLE** if not treated promptly!

DAMAGE CAN BE:

PRERENAL
Damage before the kidneys

INTRARENAL
Damage within the kidneys

POSTRENAL
Damage after the kidneys



CAUSES

PRERENAL

Damage before kidney causes ↓ blood flow to kidneys

↓ BLOOD FLOW = ↓ O₂ TO KIDNEYS

HYPOTENSION

- ▶ Shock
- ▶ Hypovolemia
- ▶ Dehydration

↓ CARDIAC OUTPUT

- ▶ Myocardial infarction
- ▶ Heart failure

OBSTRUCTION

- ▶ Tumor
- ▶ Emboli

INTRARENAL

Damage to kidneys causes ↓ functioning of kidneys

MOST SEVERE

INFECTION

- ▶ Glomerulonephritis
- ▶ Lupus (Lupus Nephritis)

NEPHROTOXINS

- ▶ CT contrast dye
- ▶ Antibiotics (Vancomycin, Gentamicin)

INJURY

- ▶ Rhabdomyolysis (damaged muscle tissue releases myoglobin & damages kidneys)

POSTRENAL

Damage after kidneys causes obstruction

URINE BACKS UP INTO KIDNEYS

ANYTHING THAT CAUSES BLOCKAGE

- ▶ Renal calculi (stones)
- ▶ Tumors
- ▶ BPH (enlarged prostate)
- ▶ Neuro damage causing retention (stroke)

PHASES of AKI

PHASE 1: ONSET (Initial injury)

PHASE 2: OLIGURIA

Glomerulus not filtering properly

<400 ML IN 24 HOURS

- ▶ ↑ specific gravity
- ▶ ↑ BUN/ Cr
- ▶ Edema
- ▶ Hypertension
- ▶ Metabolic acidosis
- ▶ Electrolyte imbalances
↓NA ↓CA ↑K+ ↑P

PHASE 3: DIURESIS

Kidneys trying to correct problem by flushing out fluid & waste

- ▶ **HIGH** urine output (3-6L/day)
- ▶ ↓ specific gravity
- ▶ Lab values beginning to correct

PHASE 4: RECOVERY

Slowly returning to normal

- ▶ Can take up to one year to fully recover
- ▶ Some patients may not recover & develop CKD

TREATMENT

FIND & TREAT UNDERLYING CAUSE

- Fluids: flush out kidneys
- Diuretics: ↓ excess fluid
- Antihypertensives
- Calcium gluconate: for hyperkalemia
- Sodium bicarbonate: correct acidosis
- Dialysis: if severe

1ST LINE TX FOR ↑K+ WITH EKG CHANGES

NURSING INTERVENTIONS

- Strict I & O
- Daily weights
- Monitor VS & EKG
- Neuro checks
- Labs & electrolytes

DIET

- ↓ sodium
- limit fluids
- ↓ potassium
- ↓ phosphate