Chapter 9

Diets for Renal and Liver Disease

The Kidneys Maintain Homeostasis

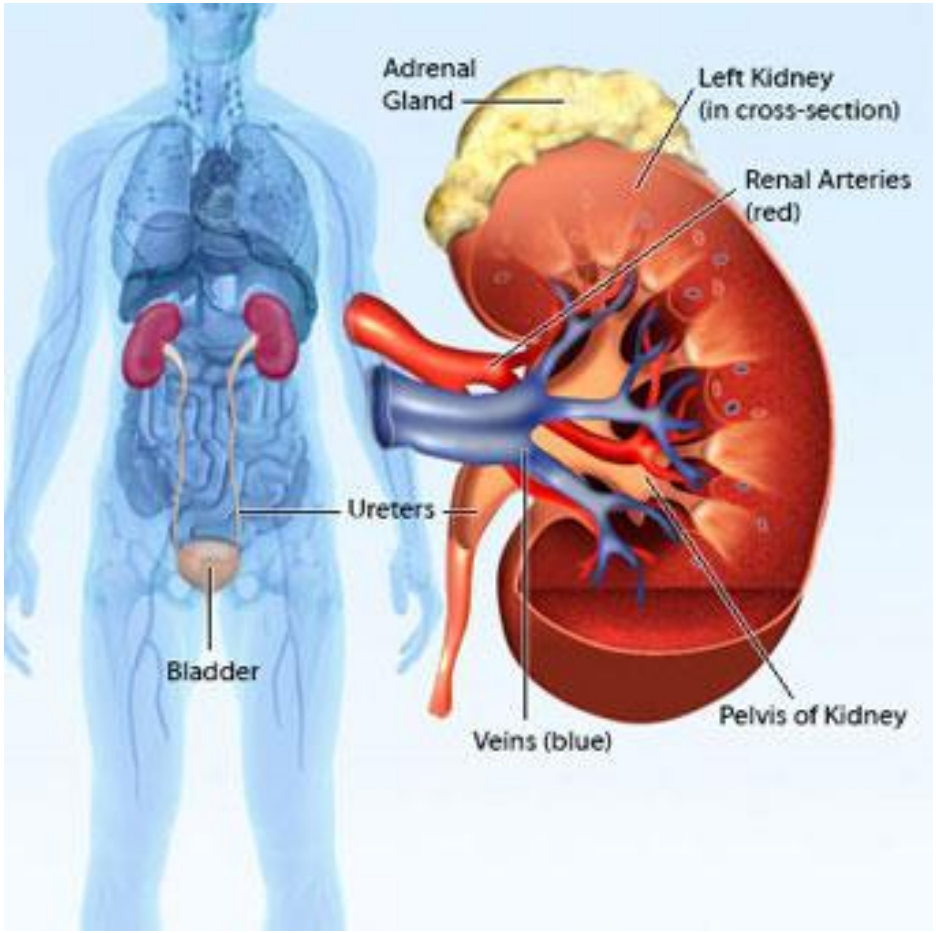
1. Regulatory function:
   - Control composition and volume of blood:
     - Maintain stable concentrations of inorganic anions such as: sodium (Na^{+}) potassium (K^{+}) calcium (Ca^{+2})
     - Adjust the volume of water lost in urine
   - Maintain acid-base balance

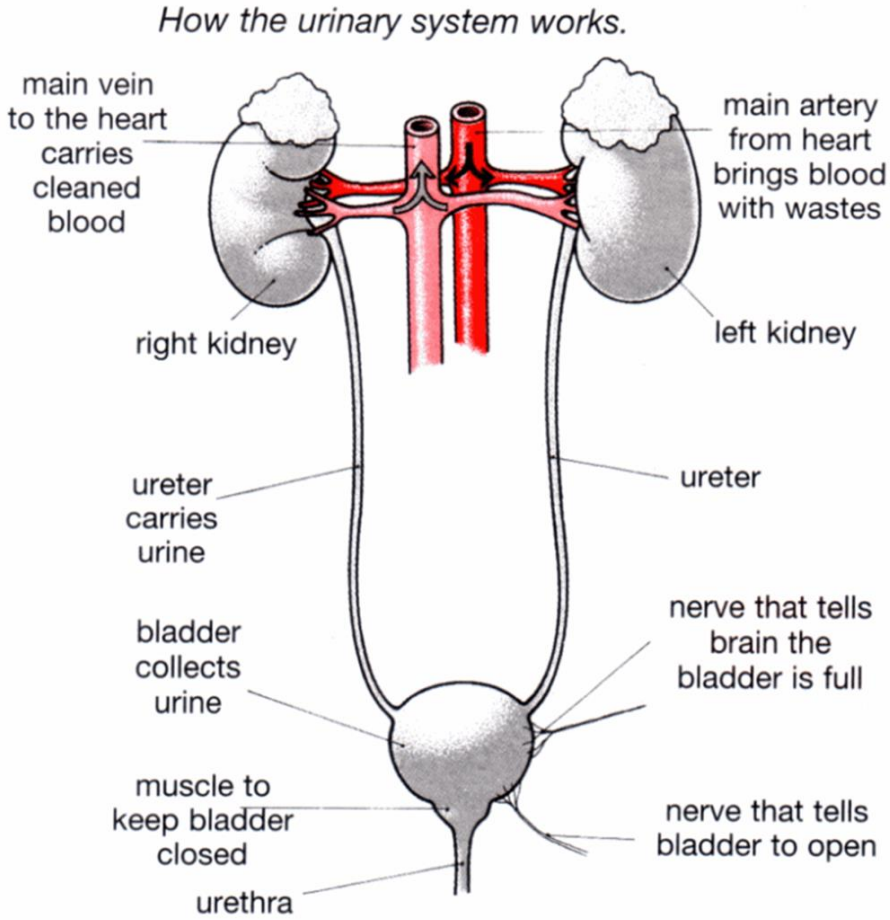
2. Excretory function:
   - Produce urine
   - Remove (excrete) metabolic waste (by-products of metabolism)
     - Including nitrogenous waste such as: urea, uric acid, creatinine, etc.

The kidneys have other Functions

3. Hormonal function
   - Produce renin (an enzyme) for blood pressure control,
   - Produce erythropoietin (a hormone) which stimulates bone marrow production of red blood cells,
   - Activate 25 (OH) D to 1, 25 (OH) D (active vitamin D)

4. Metabolic function
   - Gluconeogenesis
   - Metabolize drugs and endogenous substances (such as Insulin)

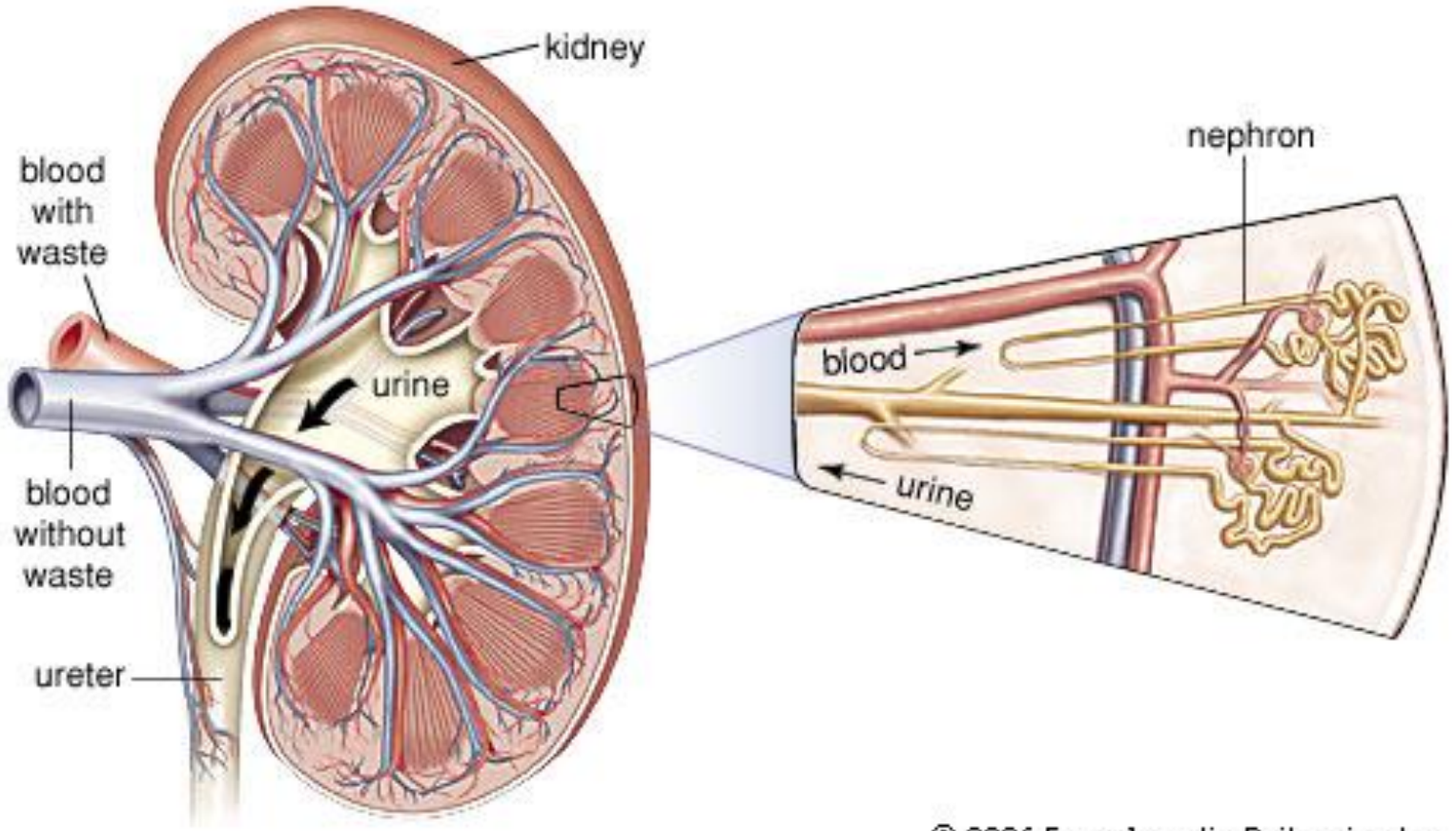




Each kidney is made up of approximately ≈ one million functioning units called nephrons.

A nephron:

- From Greek νεφρός (nephros) meaning "kidney"
- Is the basic structural and functional unit of the kidney.
- Its chief function is:
  - To regulate the concentration of water and soluble substances such as sodium salts by filtering the blood



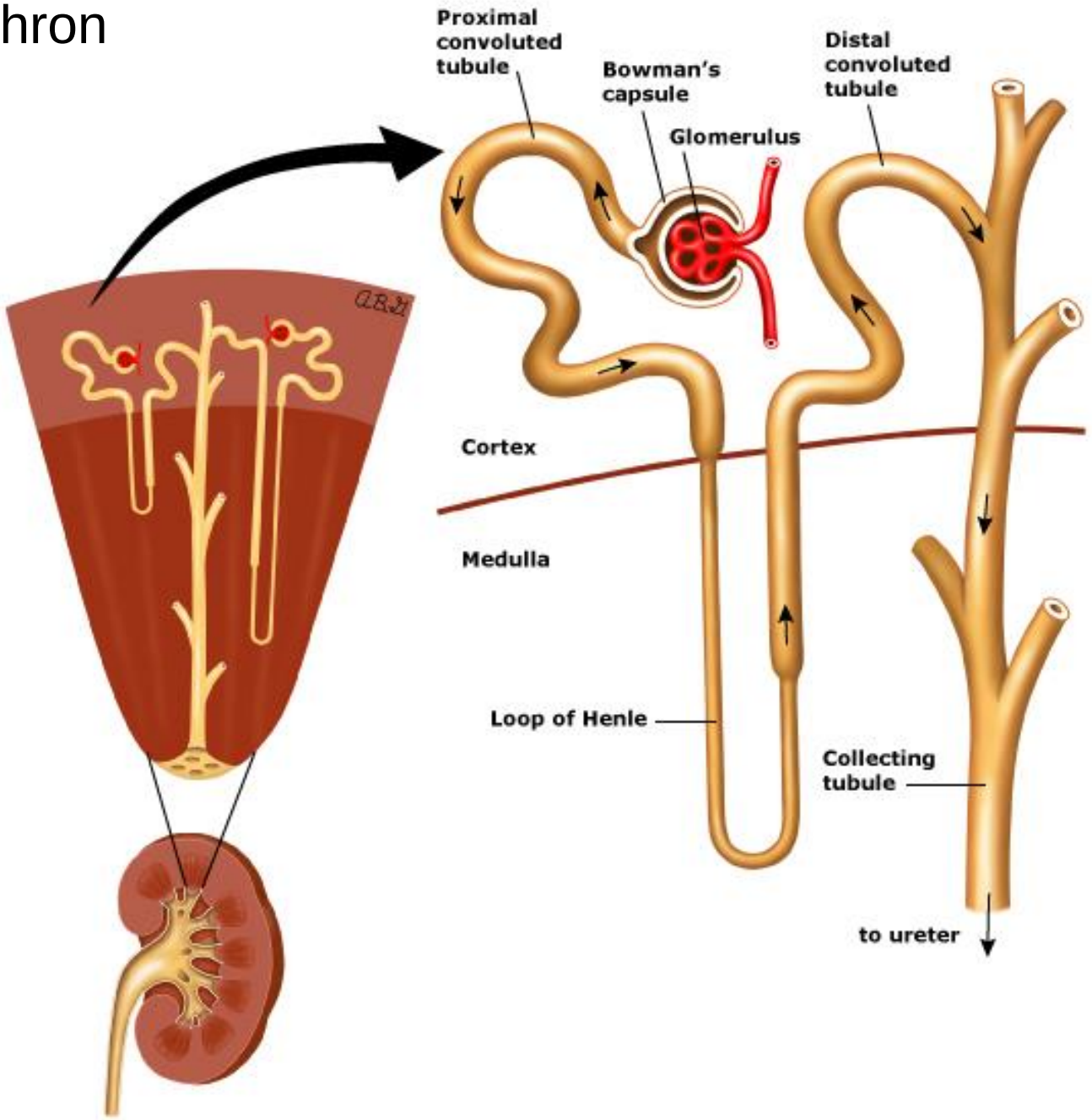
Structure of the Nephron

The nephron includes:

1] Glomerulus: the filter of the kidney, and

2] Long tubule which has several segments that function to modify the filtrate that passes through the glomerulus.

#] The tubule eventually joins a collecting duct which joins larger and larger ducts and then into the ureter

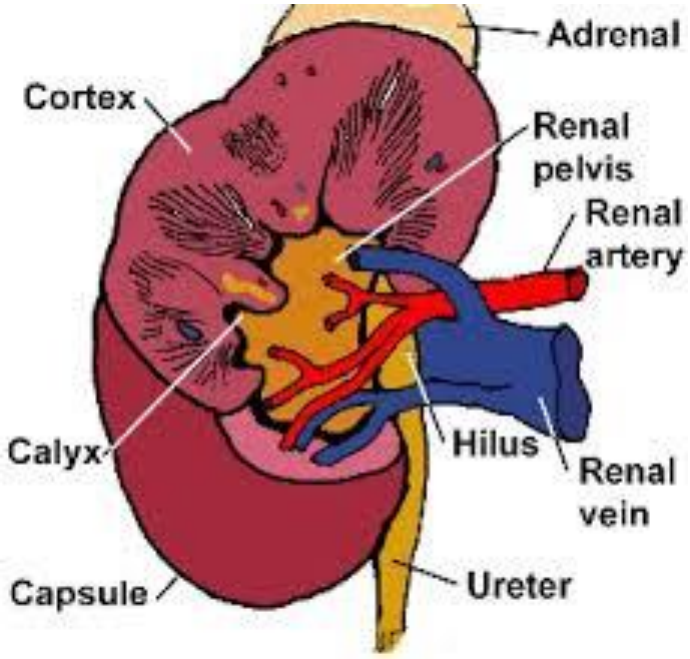


The Nephrons Function is to Maintain Balance

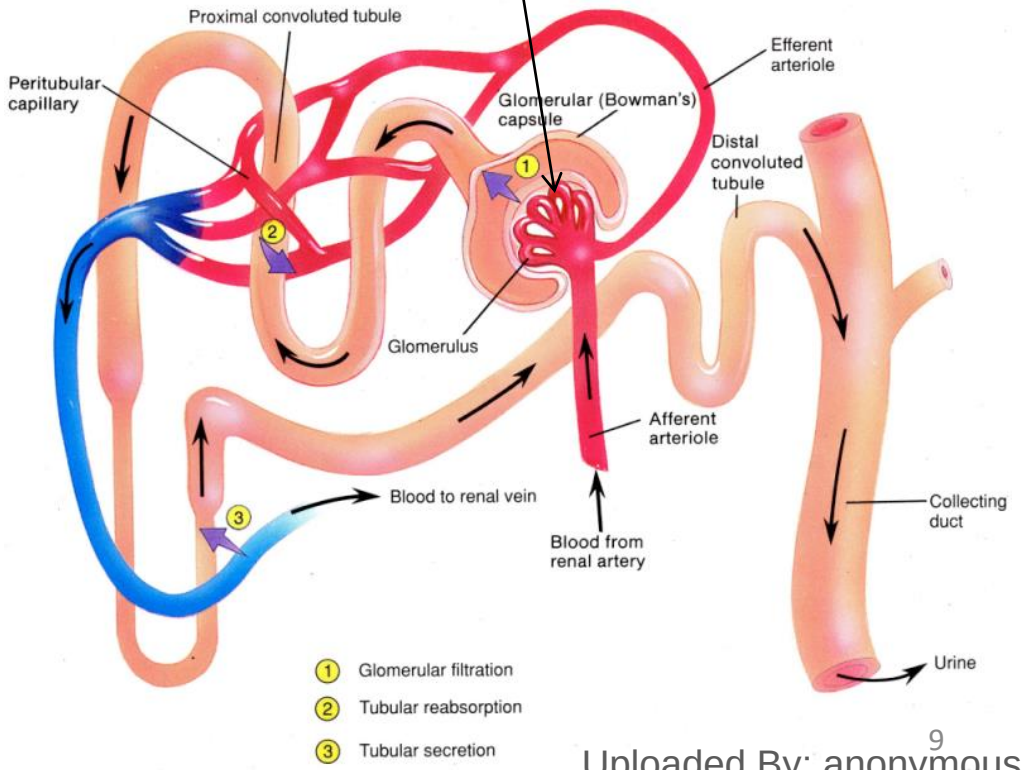
The functions include:

- Filtration
  - Glomeruli generate the ultra-filtrate (selective filtrate) of the plasma,
- Reabsorption
  - Tubules selectively reabsorb substances from the ultra-filtrate,
- Secretion
  - Tubules secrete substances into the urine,

Kidney & Nephron



Glomerulus: capillary network



Ultrafiltration is the Main Function of the Glomeruli

Filtration of plasma constituents is based on size and charge:

- Small solutes cross readily,
- Larger substances are generally restricted,
- Albumin is generally reabsorbed within the tubules of a healthy kidney,
- Volume of ultra-filtrate is 135-180 liters (L) /day,
- 99% of the water is reabsorbed resulting in 1-1.5 liters (L) urine.

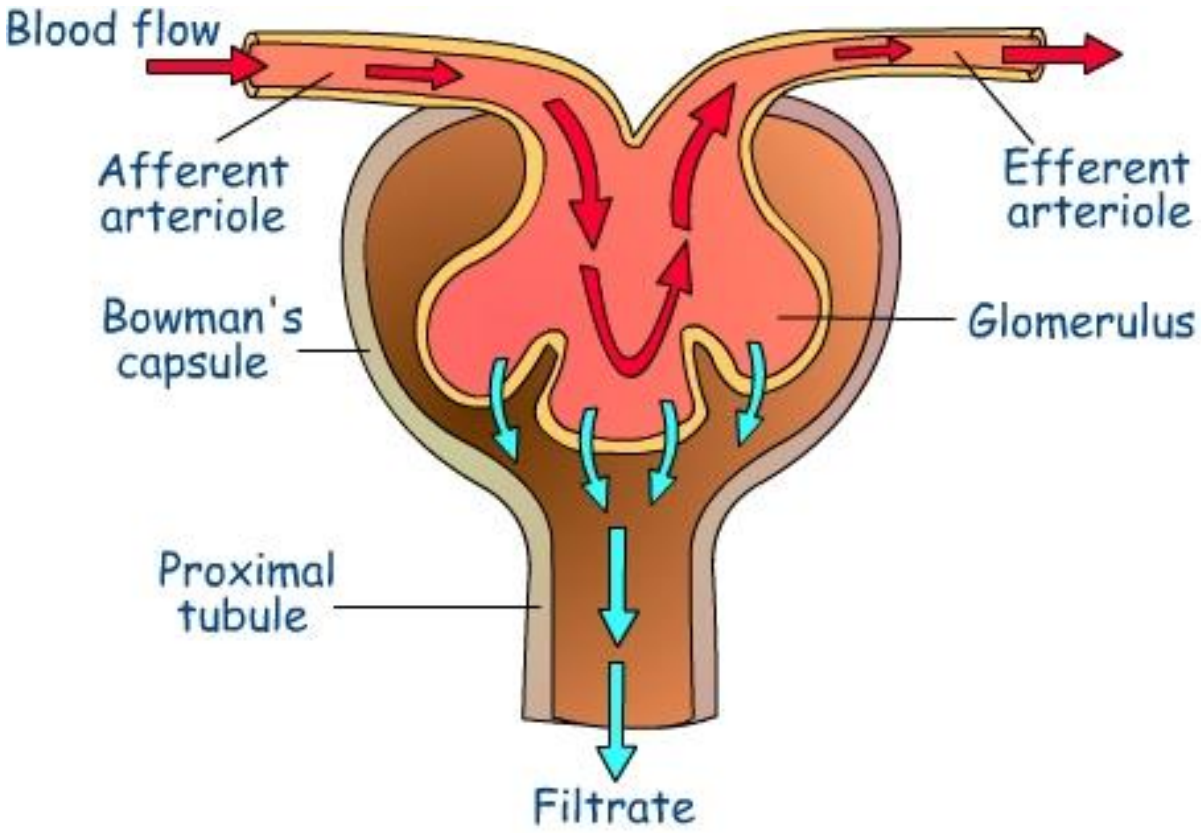
Glomerular Filtration
Bowman's Capsule

- Filtration of plasma constituents such as: glucose, amino acids, water, ions, creatinine, lactic acid, urea, uric aid, ascorbic acid, etc.

- From blood in glomerulus to "filtrate" in Bowman's capsule

- Reabsorption back to blood:
  - Glucose, amino acids, water, ions, creatinine, lactic acid, urea, uric acid, ascorbic acid, etc.

- Excretion through urine of excess amounts of blood components.



Bowman's Capsule:

A capsule-shaped membrane surrounding the glomerulus of each nephron in the kidneys that extracts wastes, excess salts, and water from the blood.

Urine Composition

- Mainly water: 95% of urine
- Other 5% of substances in urine include:
  - Urea: amino acid metabolism,
  - Uric acid: purines catabolism: purines such as: adenine, guanine: purines are nucleotides found in DNA & RNA,
  - Creatinine: breakdown of creatine phosphate in muscles; if ↑ in blood signifies impaired kidney function,
  - Electrolytes (ions): Na^+, K^+, Cl^-, Bicarbonate ($HCO3^-$),
  - Trace amounts of amino acids, glucose and lipids.

Chronic Kidney Disease (CKD) Nutrition Intervention

- According to the National Kidney Foundation (2015):
  - Normal GFR results range from 90 to 120 mL/min/1.73 m^2.
- Older people will have lower than normal GFR levels, because GFR decreases with age.

❖ Normal value ranges may vary slightly among different laboratories.

Stages of CKD

- Stages 1-4
  - Kidney function impairment
  - No need yet for dialysis or kidney transplant
- Stage 5
  - Need dialysis or kidney transplant

Classification of Kidney Disease Stages

Stage	Description	GFR ($mL/min/1.73m^2$)
1	Kidney damage with normal or increased GFR	≥ 90
2	Kidney damage with mildly decreased GFR	60-89
3	Moderately decreased GFR (Reduction of kidney function) (stage of chronic kidney disease)	30-59
4	Severely decreased GFR	15-29
5	Kidney failure	< 15

CKD

- CKD is typically a progressive disease.
- CKD is defined as:

  - Reduction of kidney function—defined as an estimated glomerular filtration rate (eGFR) of :

    < 60 mL/min/1.73 m2, and/ or

  - Evidence of kidney damage, including persistent albuminuria—defined as:

    > 30 mg albumin / gram creatinine in urine

  - Kidney failure is typically defined as:

    an eGFR of < 15 mL/min/1.73 m2.

CKD RISK FACTORS

- Diabetes,
- Hypertension,
- Family history of kidney failure,
- Cardiovascular disease,
- Recurrent urinary tract infections,
- HIV infection,
- Immunological diseases (autoimmune diseases such as: Diabetes type I, Coeliac disease).

Complications of CKD

As eGFR declines, complications occur more commonly and are more severe. These may include:

- Malnutrition,
- Metabolic acidosis due to reduced acid (hydrogen ion) excretion,
- Hyperkalemia,
- Mineral imbalance and bone disorder (calcium, phosphorus, and vitamin D),
- Anemia due to impaired erythropoiesis and low iron stores,
- Cardiovascular disease (CVD) (dyslipidemia).

CKD most Common Symptoms

- Malfunctioning kidneys cannot perform their excretory role properly leading to an increase in metabolites in blood and urine

- The most common terms (symptoms) used to describe malfunctioning kidneys include:

  - Azotemia: elevation of blood urea nitrogen (BUN) and serum creatinine,
  - Proteinuria: elevated protein in the urine,
  - Albuminuria: elevated albumin in the urine,
  - Oliguria: diminished urine output compared to fluid intake,
  - Hematuria: blood in urine,
  - Pyuria: pus in the urine.

Purpose of Diet Therapy

The purpose of diet therapy for CKD is:

- To maintain good nutritional status,
- To slow progression,
- To treat complications.

Key Components of Diet Therapy to Slow CKD Progression

- Controlling blood pressure by reducing sodium intake
- Reducing protein intake, if excessive
- Managing risk factors when they exist
- Avoid complications.

Protein and Electrolyte Controlled Diets

- Chronic renal failure diets are:
  - Prescribed by the physician
  - Diet order should specify the amounts of:
    - Protein
    - Electrolytes
    - Fluids

- Dietary restrictions are calculated by the clinical dietitian who:
  - Should teach the patient and / or care giver about these restrictions.

Goals of Chronic Renal Failure Diet Restrictions

- Achieve a balance between intake and output:
  - Alleviate symptoms
  - Maintain adequate nutrition
  - Delay progression to dialysis

- Diet therapy focuses on controlling 5 nutrients:
  - Protein
  - Sodium
  - Potassium
  - Phosphorus
  - Fluids

Adequacy

- May not provide adequate quantities of:
  - Protein
  - Fe
  - Ca
  - Thiamin [B1]
  - Riboflavin [B2]
  - Niacin
  - Vitamin D

Dietary Planning for Chronic Renal Failure

- Protein:

  - 0.60g/kg body weight is the lowest recommended amount + 24 hour urinary protein loss:

    - ✓ At least ½ of total protein should come from high biologic value (HBV) foods such as meat and dairy,

    - ✓ Rest of protein comes from grains and vegetables.

Dietary Planning for Chronic Renal Failure

- Calories:

  - Adjusted as necessary for slow weight gain or weight loss or weight maintenance,

  - Patient should receive adequate energy [Calories] in order to ensure that protein is used for growth and/or repair rather than as an energy source.

  - Additional Calories can be provided by:
    - ✓ Fats
    - ✓ Sugars
    - ✓ High Cal low protein formulas
    - ✓ Low protein bread products

Dietary Planning for Chronic Renal Failure

- Sodium: 1500 - < 2000 mg/day,
- Fluid restriction [when needed] should be individualized:
  - ✓ Generally: 24 hour urine out + 500 ml for insensible water loss
- Phosphorus & potassium restrictions vary:
  - ✓ Salt substitutes should be authorized by physician or dietitian because they might increase K^+ intake [if not well calculated],
  - ✓ KCl is very rich in K^+, 1 tsp contains between 2,240 mg and 3,180 mg potassium.

In kidney failure restrictions depend on stage of the disease or failure [acute; chronic; end stage (dialysis)]; but generally:

- Na^+ is the first restriction,
- Followed by restrictions in:
  - Protein
  - K^+
  - Phosphorus

- As the patient approaches dialysis and decreased urine output then fluid is restricted.

Nephrotic Syndrome

- Nephrotic syndrome is a kidney disorder that causes the body to pass too much protein in urine.
- Nephrotic syndrome is usually caused by damage to the clusters of small blood vessels in the kidneys that filter waste and excess water from blood.
- The condition causes swelling, particularly in your feet and ankles, and increases the risk of other health problems.

Nephrotic Syndrome

- A collection of symptoms that occur:
  - When increased permeability in the glomeruli
    - Allows serum proteins to leak into urine.

- Major symptoms are:
  - Proteinuria
  - Hypoalbuminemia
  - Hyperlipidemia
  - Edema

Nephrotic Syndrome Nutrition Therapy Goal

- Minimize edema, proteinuria, & hyperlipidemia,
- Replace nutrients lost in urine,
- Reduce the risk of progressive renal damage.

❖ In order to decrease protein losses and edema:

- Mild protein restriction:
  - ➢ Decreases loss of protein.

+

- Angiotensin-converting enzyme inhibitor (a medication):
  - ➢ Decreases body retention of water which in turn lowers blood pressure.

Liver

Functions of a Healthy Liver

- Regulates the composition of blood, including the amounts of sugar (glucose), protein, and fat that enter the bloodstream.

- Removes bilirubin, ammonia, and other toxins from the blood.

  - Bilirubin is a by-product of the breakdown of hemoglobin from aged or abnormal red blood cells.
  - Ammonia forms when protein is broken down.

- Processes most of the nutrients that are absorbed by the intestines during digestion and converts those nutrients into forms that can be used by the body.

Functions of a Healthy Liver Cont'd.

- Stores some nutrients, such as vitamin A, iron, and other minerals.
- Produces cholesterol and certain important proteins, such as albumin.
- Produces clotting factors, chemicals needed to help blood clot.
- Breaks down (metabolizes) alcohol and many drugs.

Liver Failure

- Liver failure occurs when:
  - Large parts of the liver become damaged beyond repair and the liver is no longer able to function.

- Liver failure is a life-threatening condition that demands urgent medical care.

- Most often, liver failure occurs gradually and over many years.

Causes of Liver Failure

The most common causes of chronic liver failure (where the liver fails over months to years) include:

- Hepatitis B,
- Hepatitis C,
- Long term alcohol consumption,
- Cirrhosis (scar tissue replaces liver tissue and blocks blood flow through the liver),
- Hemochromatosis (an inherited disorder that causes the body to absorb and store too much iron),
- Malnutrition.

Dietary Planning for Liver Failure

In liver failure the usual restrictions are in:

- Protein
- Na^+
- Fluids

Exchange System for Protein and Electrolytes

- The basis of classification is protein and electrolyte content of foods.
- It is used to calculate: protein, sodium, potassium and phosphorus.
- Certain values are used to calculate protein, sodium, potassium and phosphorus content of food groups for meal planning.

Food group	Exchange Unit	Kcal	Protein (g)	CHO (g)	Fat (g)	Na^+ (mg)	K^+ (mg)	P (mg)
Milk *** (whole)	½ c	75	4	6	4	80	185	110
Nondairy milk substitutes especially coconut milk Read labels	1 c	140	0.5	12	10	40	80	30

Cheese is high in P and should be limited to once a week = 1 oz. serving

*** Energy content of milk group foods depends on the type of food chosen

Food group	Exchange Unit	Kcal	Protein (g)	CHO (g)	Fat (g)	Na^+ (mg)	K^+ (mg)	P (mg)
Meat (lean)	1 oz.	45	7	0	2	25	100	65
Meat *** (medium fat)	1 oz.	75	7	0	5	25	100	65
Meat (high fat)	1 oz.	100	7	0	8	25	100	65

Unsalted peanut butter is high in K & P, and should be limited to ≈ ½ oz. a week = 1 Tbsp. serving

Legumes are high in Potassium & Phosphorus

*** Energy content of meat group foods depends on the type of food chosen.

Food group	Exchange Unit	Kcal	Protein (g)	CHO (g)	Fat (g)	Na^+ (mg)	K^+ (mg)	P (mg)
Vegetables	½ c (cooked or raw) unless otherwise indicated e.g. 1 c lettuce ¼ c high↑ K^+ and ↑ P vegetables							
Low K^+		25	2	5	0	15	70	20
Medium K^+		25	2	5	0	15	150	20
High K^+		25	2	5	0	15	270	20

Food group	Exchange Unit	Kcal	Protein (g)	CHO (g)	Fat (g)	Na^+ (mg)	K^+ (mg)	P (mg)
Fruits*	½ c unless otherwise indicated							
Low K^+		60	0.5	15	0	5	70	15
Medium K^+		60	0.5	15	0	5	150	15
High K^+		60	0.5	15	0	5	270	15

*Fruits canned in heavy syrup count as 100 Calories and 25 CHO

Food group	Exchange Unit	Kcal	Protein (g)	CHO (g)	Fat (g)	Na^+ (mg)	K^+ (mg)	P (mg)
Starch Refined	½ c (rice, pasta, etc; other 1 oz. bread 1/3 c oatmeal	80	3	15	1	80	35	35
Beans Boiled unsalted	½ c	115 V	7 + V	15 + V	3 V	Traces V	270 V	150 V

Food group	Exchange Unit	Kcal	Protein (g)	CHO (g)	Fat (g)	Na^+ (mg)	K^+ (mg)	P (mg)
Oils/Fats *	1 exchange unit	45	0	0	5	55	10	5
Salt Choices	1/8 tsp salt	0	0	0	0	300	0	0

- *Oils contain traces of Na , K, and P e.g. olive oil, corn oil, canola oil, soy oil, sunflower oil, walnut oil, etc.
- *Tahineh contains traces of Na, and is high in P
- *Unsalted peanut butter is high in K & P and should be limited to oz. / week = ½ Tbsp. / serving

Food group	Exchange Unit	Kcal	Protein (g)	CHO (g)	Fat (g)	Na^+ (mg)	K^+ (mg)	P (mg)
Hot Beverages Coffee, Tea	1/2 c	0	0	0	0	0	65	5
↓ Calorie Beverages Diet drinks	1/2 c	0	0	0	0	0	20	10
↑ Calorie choices (beverages candies, sweets)	1/2 c beverages (candies and sweets varies)	60	0	15	0	15	20	5

Acceptable Levels of Deviation

- Protein (+) or (– 5 g),
- Na^+, K^+, and P: up to 100 mg over the limit,
- Fluid: up to 50 ml over the limit [1 ml = 1cc].

Classification of Vegetables according to Potassium Content Level

Vegetables	Low Potassium	Medium Potassium	High Potassium
	1. Cabbage 2. Celery 3. Green beans 4. Lettuce (iceberg) 5. Onions 6. Peas 7. Bamboo Shoots 8. Bean Sprouts 9. Water Chestnuts 10. Wax (Yellow) Beans	1. Beets (canned, boiled, drained) 2. Broccoli 3. Carrots 4. Cauliflower 5. Corn 6. Cucumber (peeled) 7. Eggplants 8. Peppers (green/red) 9. Mushrooms (¼ cup) 10. Mixed Vegetables (canned or frozen)	1. Artichoke 2. Asparagus 3. Legumes, dried, cooked 4. Beet Greens (cooked) 5. Beets 6. Brussels Sprouts 7. Collard greens cooked 8. Kale 9. Kohlrabi 10. Parsnips

Classification of Vegetables according to Potassium Content Level Cont'd.

Vegetables	Low Potassium	Medium Potassium	High Potassium
		1. Mustard Greens, cooked 2. Okra 3. Spinach (fresh) 4. Potatoes, mashed made w/water, boxed flakes or granules 5. Turnips 6. Turnip Greens, cooked 7. Radishes 8. Zucchini (summer squash) 9. Condiments such as ketchup, chili sauce, taco sauce or salsa, (2 Tbsp.)	1. Potato (baked, boiled or prepared from frozen), mashed(homemade) 2. Spinach (cooked) 3. Pumpkin (canned) 4. Salsa 5. Squash, winter, cooked 6. Swiss chard (cooked) 7. Sweet potato (cooked) 8. Tomato (whole, juice or sauce) 9. Vegetable juice

Classification of Fruits according to Potassium Content Level

Low Potassium	Medium Potassium	High Potassium
1. Applesauce 2. Blueberries 3. Fruit cocktail 4. Grapes including juice 5. Pears, raw & canned 6. Pineapples including juice 7. Raspberries 8. Watermelon 9. Cranberry juice (1/2 c) Cranberries 1 c)	1. Apples including juice 2. Apricots 3. Blackberries 4. Cherries 5. Grapefruit ½ medium 6. Peaches raw and canned 7. Plums raw and canned 8. Strawberries 9. Tangerines (Mandarin Orange) 10. Tropical Fruit Mix, canned	1. Avocado 2. Bananas 3. Cantaloupe 4. Dried fruits, raisins 5. Honeydew melon 6. Kiwifruit 7. Mango 8. Nectarine 9. Oranges (fruit & juice) 10. Papaya 11. Pomegranate 12. Prunes (fruit & juice

High Phosphorus Foods

Food Group	Foods High in Phosphorus
Vegetables	None
Fruits	None
Grains	Whole wheat and its products; Bran; Corn tortillas and corn bread; Brown rice
Dairy products	Milk, cheese, yogurt, cottage cheese, eggnog
Protein foods	Meat, poultry, fish, eggs, legumes, nuts and seeds, soybean and it products
Oils and fats	None
Deserts	Chocolate containing foods; Milk containing foods; Baking powder containing foods

High Phosphorus Foods Substitutes

Instead of:	Replace with:
Milk	Half and half cream or nondairy creamer
Cheese	Cream cheese
Legumes	Mixed vegetable or green beans
Ice cream	Sherbet, sorbet
Nuts and seeds	Pretzels, snacks that do not contain nuts and/or seeds
Peanut butter (2 Tbsps.)	Limit to 1 Tbsp. with jelly
Chocolate	Crackers, hard candy, jellied candy
Whole grains	Refined
Cola and pepper-mint type carbonated drinks, beverages containing phosphoric acid.	Coffee, tea, lemonade, fruit juice

General Guidelines

- Milk [High in K^+] : Milk, all types; yogurt; buttermilk; ice cream (½ c/choice) ; cream cheese: 3 Tbsp. / choice, sour cream: 1/4 c /choice

- Meat: Beef; pork; lamb; veal; fish; poultry; cheese (1 oz./ choice); eggs:(1 large); egg whites: 2/ choice; cottage cheese: 1/4 c / choice; peanut butter: 1Tbsp. / choice

  - Cheese and peanut butter are high in P, so they should be used only once a week if need be.

  - Avoid processed products

- Grains: Choose refined products:
  - Avoid bread products that are high in Na^+;
  - White bread is preferred [whole wheat only when advised by the dietitian]; Whole grains are generally high in K^+ and P
  - No bran; refined cereals are preferred.

General Guidelines
Vegetables

- High potassium and phosphorus
  - Should not be used unless approved by dietitian;
  - 1/4 c serving if allowed.
- High potassium examples:
  - Tomato: 1 -2 slices/meal
  - Tomato juice : ¼ c
  - Tomato puree: 2 Tbsp
  - Potatoes [boiled or mashed & baked] ; Sweet potatoes ; Pumpkin canned
  - Avocado
  - Spinach, cooked; Beet greens cooked; Okra; Brussels Sprouts; Mushrooms: fresh or cooked
- High phosphorus examples:
  - Corn and green peas
  - Mushrooms: fresh or canned

General Guidelines
Fruits

- High in potassium:
  - ➢ Examples: Apricots; Cantaloupe; Dates; Nectarine; Oranges and Juice; Pears;

- Very High in potassium:
  - ✓ Should be approved by dietitian;
  - ➢ Examples:
    - ○ Banana: 1/2 medium / choice;
    - ○ Prunes: 5 , Prune juice 1/3 c / choice

❖ Starfruit is toxic for kidney disease patients and should not be served.

General Guidelines
High kcal Choices

- Beverages:
  - ✓ Those used to raise blood glucose levels in diabetics who suffer from hypoglycemic
  - ✓ Exclude drinks that might be high in potassium and/phosphorus such as: Cola drinks, Pepper type drinks; and fruit juices such as orange juice

- Desserts:
  - ✓ Avoid: Chocolate; Molasses; Nuts and Nut butters [high in phosphorus and / or potassium].

- Hot Beverages:
  - ✓ Coffee, Tea: ½ c / choice, can add sugar for extra kcals.

Salt Choices

- Salt choices
  - ✓ Should be approved by the dietitian
- Examples:
  - ✓ Salt: 1/8 tsp.
  - ✓ Olives: 2 medium
  - ✓ Ketchup [high in K^+]: 2 Tbsp. / choice
  - ✓ Salt substitutes [those containing KCl]: should be checked before approval [check nutrient analysis].
  - ✓ Salt substitutes are high in K^+
  - ✓ Low sodium broth and bouillon could be high (may contain KCl)

Potassium Chloride (KCl)

Potassium Chloride (KCl) is a salt composed of potassium and chlorine. It's used in medicine as a potassium supplement, in food as a salt substitute, and in agriculture as a fertilizer.

$$KOH + HCl \rightarrow KCl + H_2O$$

Ex Examples.com

Fluids & Snacks

- Fluids:
  - ✓ Anything that is liquid or turns into liquid at room temperature including ice cream and gelatin [becomes liquid when swallowed],
  - ✓ Renal patients on Hemodialysis typically need fluid restriction.
  - ✓ Even liquid consumed with the medication should be counted.
- Snacks:
  - ✓ Should be part of the daily allowances.

Diet Prescription & Distribution of the Daily Choices for Protein and Electrolyte Controlled Diets

Diet Prescriptions	1st prescription	2nd prescription	3rd prescription
Protein level (g)	40	60	80
Calories	1775	1800	2040
Sodium (mg)	1920	1845	2030
Potassium (mg)	2180	2325	2600
Phosphorus (mg)	695	890	1150
Food Group	1st prescription	2nd prescription	3rd prescription
Milk (1/2 c/choice)	1	1	2
Nondairy, milk substitutes	0	0	0

Diet Prescription & Distribution of the Daily Choices for Protein and Electrolyte Controlled Diets

Food Group	1st prescription	2nd prescription	3rd prescription
Meat	3	5	7
Starch	5	8	8
Vegetables			
Low K^+	1	1	1
Medium K^+	1	1	2
High K^+	1	1	1

Diet Prescription & Distribution of the Daily Choices for Protein and Electrolyte Controlled Diets

Food Group	1st prescription	2nd prescription	3rd prescription
Fruits			
Low K^+	2	1	1
Medium K^+	2	2	2
High K^+	1	1	1
Oils/Fats	9	8	9

Diet Prescription & Distribution of the Daily Choices for Protein and Electrolyte Controlled Diets

Food Group	1st prescription	2nd prescription	3rd prescription
High Calorie items (1/2 c / choice)	5	1	0
Hot Beverages (1/2 c / choice)	2	2	2
Low Calorie (sugar free items) (1/2 c / choice)	0	0	0
Salt Choices 1/8 tsp / choice	3	2	2

When & Why is Renal Dialysis Used

- Dialysis is used in end stage renal disease (chronic kidney disease stage 5).
- Dialysis is done to remove the harmful wastes and extra salt and fluids.
- This helps control blood pressure and keep the proper balance of electrolytes such as potassium and sodium in the body.
- There are 2 kinds of dialysis.

Kinds of Dialysis

There are two kinds of dialysis.

1. Hemodialysis
    - Blood is pumped out of the body to an artificial kidney machine, and returned to the body by tubes that connect the patient to the machine.

2. Peritoneal dialysis
    - The inside lining of the abdomen acts as a natural filter.
    - Wastes are taken out by means of a cleansing fluid called dialysate, which is washed in and out of the abdomen in cycles.

:

Hemodialysis Machine

Hemo = blood

Dialysis = process of removing waste and excess water from the blood.

Hemodialysis

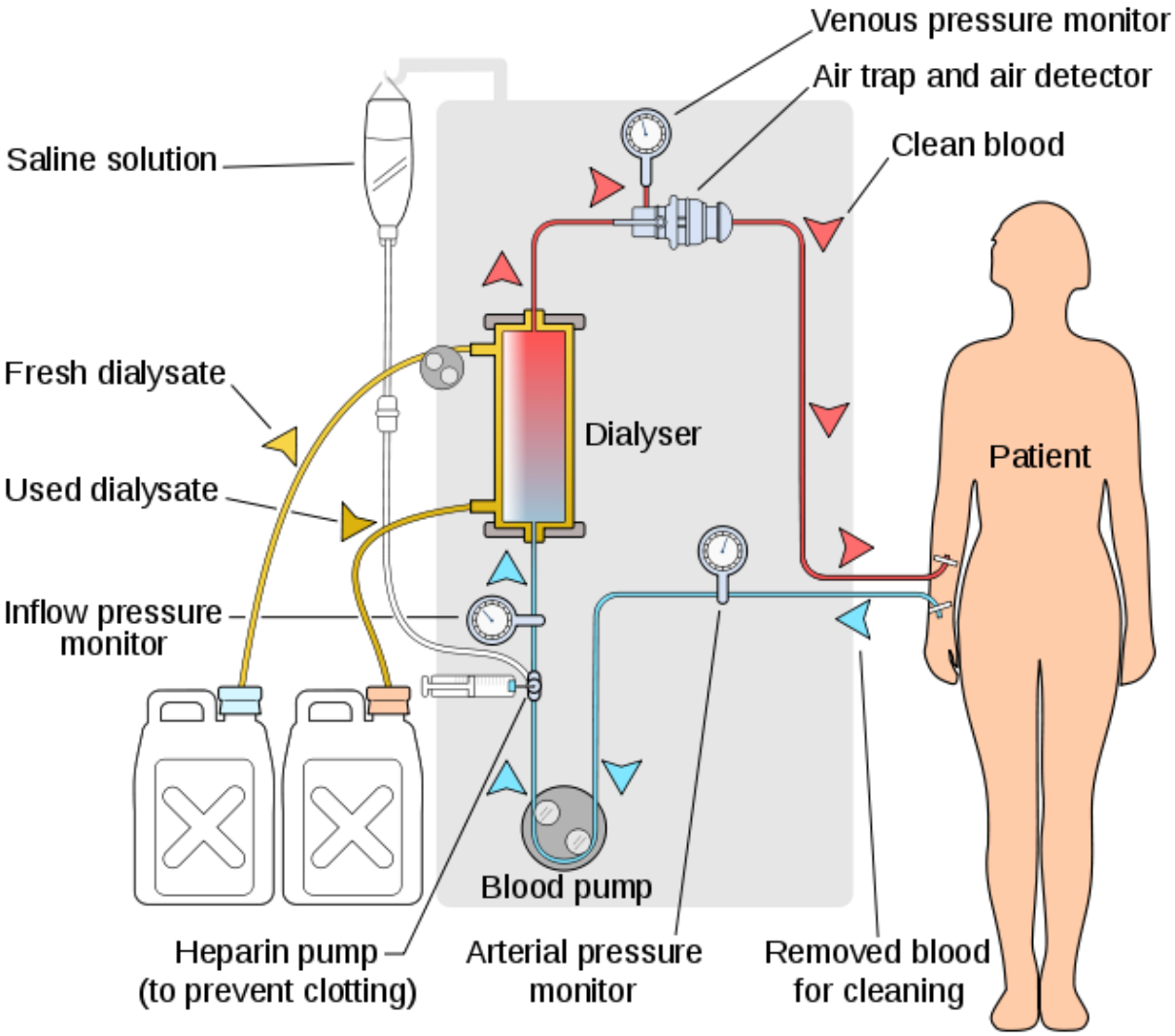
In hemodialysis,

Blood is allowed to flow, a few ounces at a time, through a special filter that removes wastes and extra fluids.

The clean blood is then returned to the body.

Hemodialysis uses a man-made membrane (dialyzer) to filter wastes and remove extra fluid from the blood.

The average amount of time is 4 hours/session
3 times/week



Some of the Components of a Conventional Dialysate

- Sodium
- Potassium
- Bicarbonate
- Calcium
- Magnesium
- Glucose
- Phosphorus
- + Other components

Peritoneal Dialysis

Uses the lining of the abdominal cavity (peritoneal membrane) and a solution (dialysate) to remove wastes and extra fluid from the body.

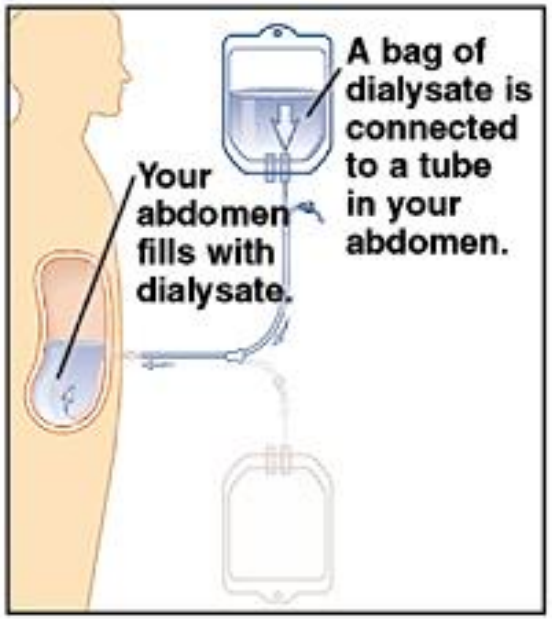
An exchange is the process of putting in and taking out the fluid.

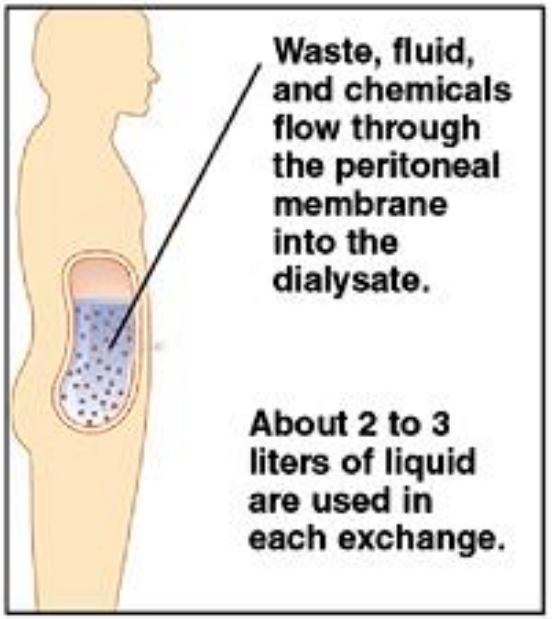
Patient usually completes 4 to 6 exchanges each day.

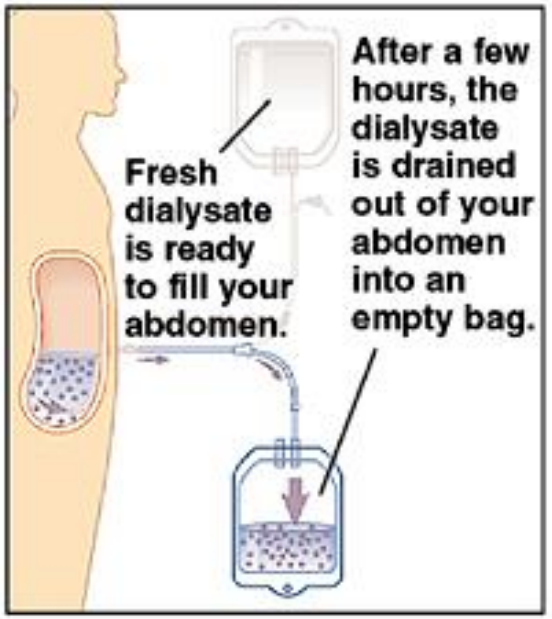
Takes a few hours / exchange.

Done at home after being trained.

Peritoneal Dialysis (PD)







Done at home after being trained

Kinds of Peritoneal Dialysis

There are two kinds of peritoneal dialysis:

1. Continuous Ambulatory Peritoneal Dialysis (CAPD),

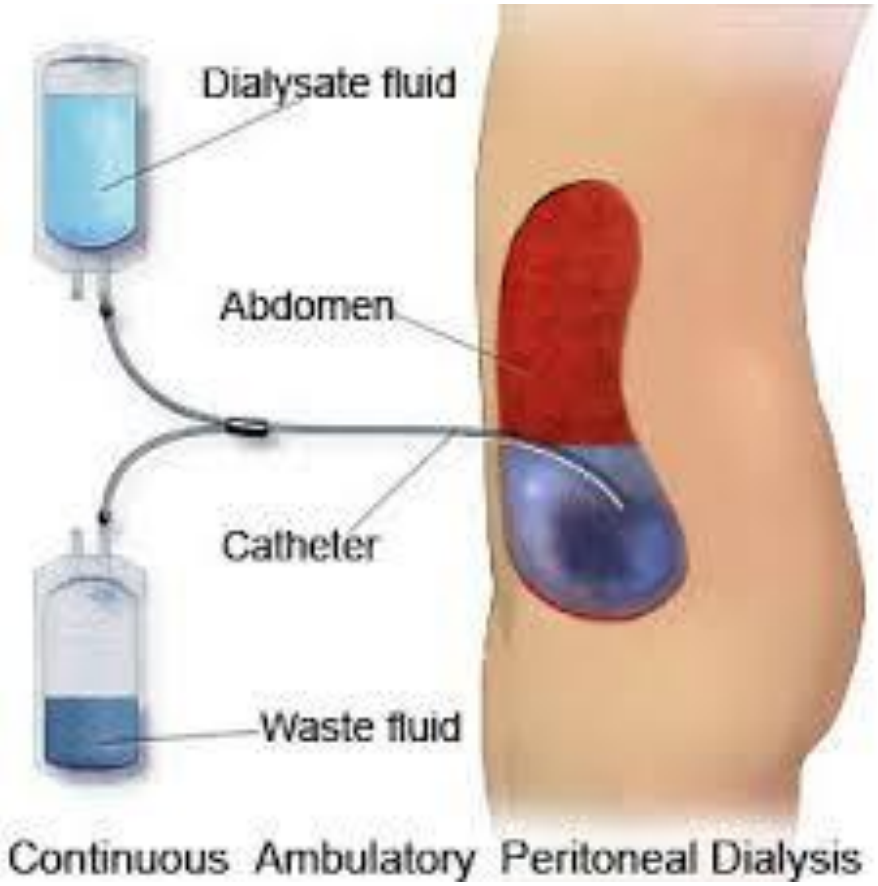
2. Automated Peritoneal Dialysis (APD).

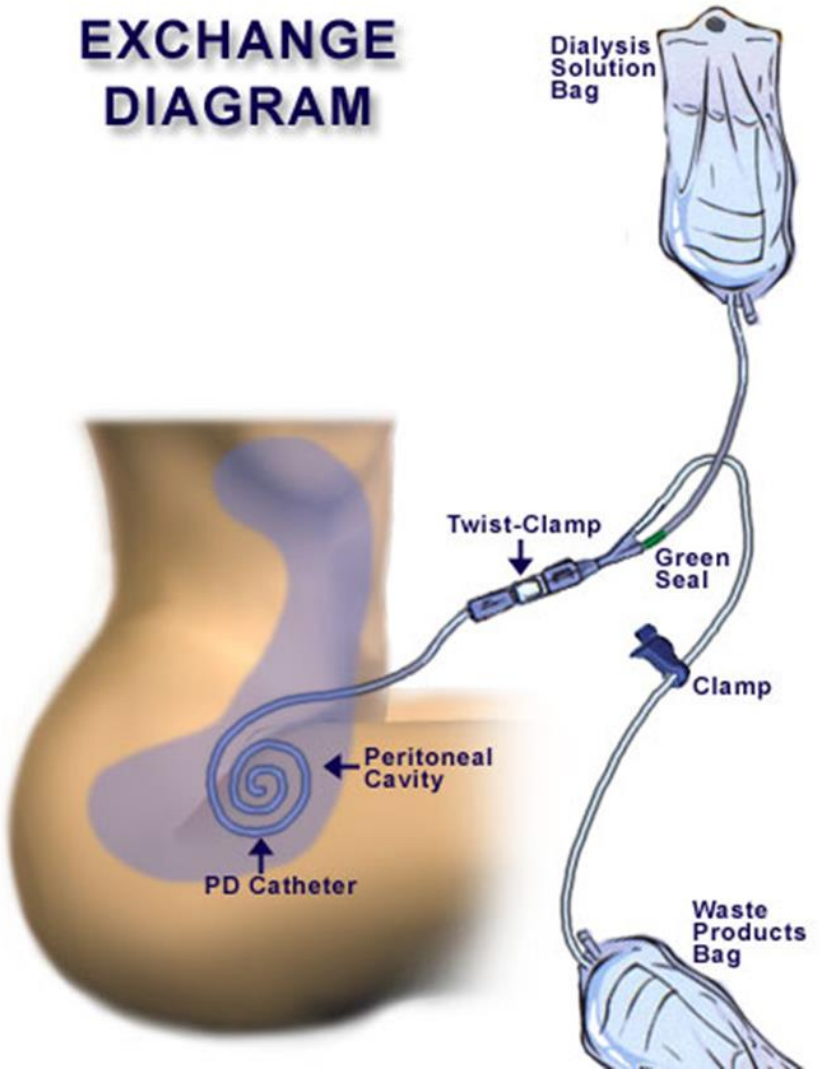
- The basic treatment is the same for each.
- However, the # of treatments and the way the treatments are done make each method different.

Continuous Ambulatory Peritoneal Dialysis [CAPD]

- CAPD is "continuous," machine-free and done while patient is doing his/her normal activities such as work or school.
- Treatment is done by placing about 2 quarts (≈ 2 liters) of cleansing fluid into abdomen and later draining it.
- This is done by hooking up a plastic bag of cleansing fluid to a tube in the abdomen.
- Raising the plastic bag to shoulder level causes gravity to pull down the fluid into the abdomen.
- When empty, the plastic bag is removed and thrown away.

CAPD (Continuous Ambulatory Peritoneal Dialysis)





CAPD Cont'd.

- When an exchange is finished, the fluid (which now has wastes removed from blood) is drained from the abdomen and thrown away.
- This process usually is done (3, 4 or 5 times) in a 24-hour period while awake during normal activities.
- Each exchange takes about 30 to 40 minutes.
- Some patients like to do their exchanges at mealtimes and at bedtime.

Automated Peritoneal Dialysis
APD

- APD differs from CAPD in that a machine (cycler) delivers and then drains the cleansing fluid.

- The treatment usually is done at night while asleep.

Modified Renal Diet (MRD)

- Used in:
  - Renal dialysis patients
  - Patients on renal dialysis and reside in long term care facilities.
- These patients are often:
  - ➢ Malnourished
  - ➢ Have poor appetite
  - ➢ Feel nausea/vomiting
- Because of: both the medication & the diet:
  - ➢ Diet may be inadequate in both Ca and Vitamin D.

Renal Dietitian

- Will need to recommend appropriate vitamins and minerals according to need.

- Any over the counter nutritional supplements, such as multivitamins, minerals, and amino acids:
  - Should be used only with the approval of the renal physician or renal dietitian.

Recommendations for Dialysis Patients (MRD)

- Energy: should be adequate
  - ✓ ≈ 30-35 kcal/kg/day
- CHO: should be adequate to spare protein
  - ✓ Use refined starches and simple sugars
- Protein: higher needs:
  - ✓ ≥ 1.1 g/kg/day
  - ✓ ≥ 1.2 /kg/day for Peritoneal Dialysis

(MRD)
Daily Amounts of Meat Group Foods Recommendations

- At least 6 oz of meat or meat alternatives per day should be encouraged.

  ✓ High biologic value protein is preferred.

  ✓ At least ½ the protein should come from animal sources.

- Meat Portions recommendations:
  - ✓ Double egg portion/serving
  - ✓ Large meat portions
  - ✓ Meat Sandwiches for snacks

MRD

- Na^+: is usually restricted: use the no added salt diet [low salt diet]
- P: needs to be restricted to limit bone loss associated with renal disease.
  - ✓ Phosphate and Ca ions form hydroxyapatite $Ca5(PO4)3(OH)$, a major and essential component of bone and teeth.

- P is found in phytate containing foods such as whole grains and beans [legumes]; that is why refined cereals and their products are recommended
  - ✓ Whole grains; legumes; milk and products [high in P]; limit cheese to ½ oz. / day.

MRD

- K^+: Dialysis patients especially CAPD patients usually experience low levels of K^+; so it does not have to be restricted.

  - K^+ intake is dictated by the patient's lab test values, so it is individual.
  - K^+ has a role in keeping the heartbeat regular and the muscles working properly.

- Fluids: limit as needed, Fluid restriction depends on urine output

  - 1fl. oz. = 1/8 c = 30 ml = 30cc
  - 8 fl. oz. = 1 c = 240 ml or 240 cc.

Emergency Dialysis Diet

Potassium	Choose only the lowest K^+ fruits, vegetables and juices Limit fruits to 1 ½ c / day Limit vegetables to ½ c / day Limit juice to ½ c / day
Phosphorus	Limit fluid milk to ½ c / day Avoid cheese, yogurt and ice cream
Protein foods	Limit meat, poultry, fish and eggs to a total of 4 oz. / day Avoid high sodium items such as deli meats and peanut butter
Fluids	Limit salty foods to avoid drinking too much liquids. Drink only half the amount usually allowed
Carbohydrates	Eat refined grains and their product