SNS COLLEGE OF ALLIED HEALTH SCIENCES

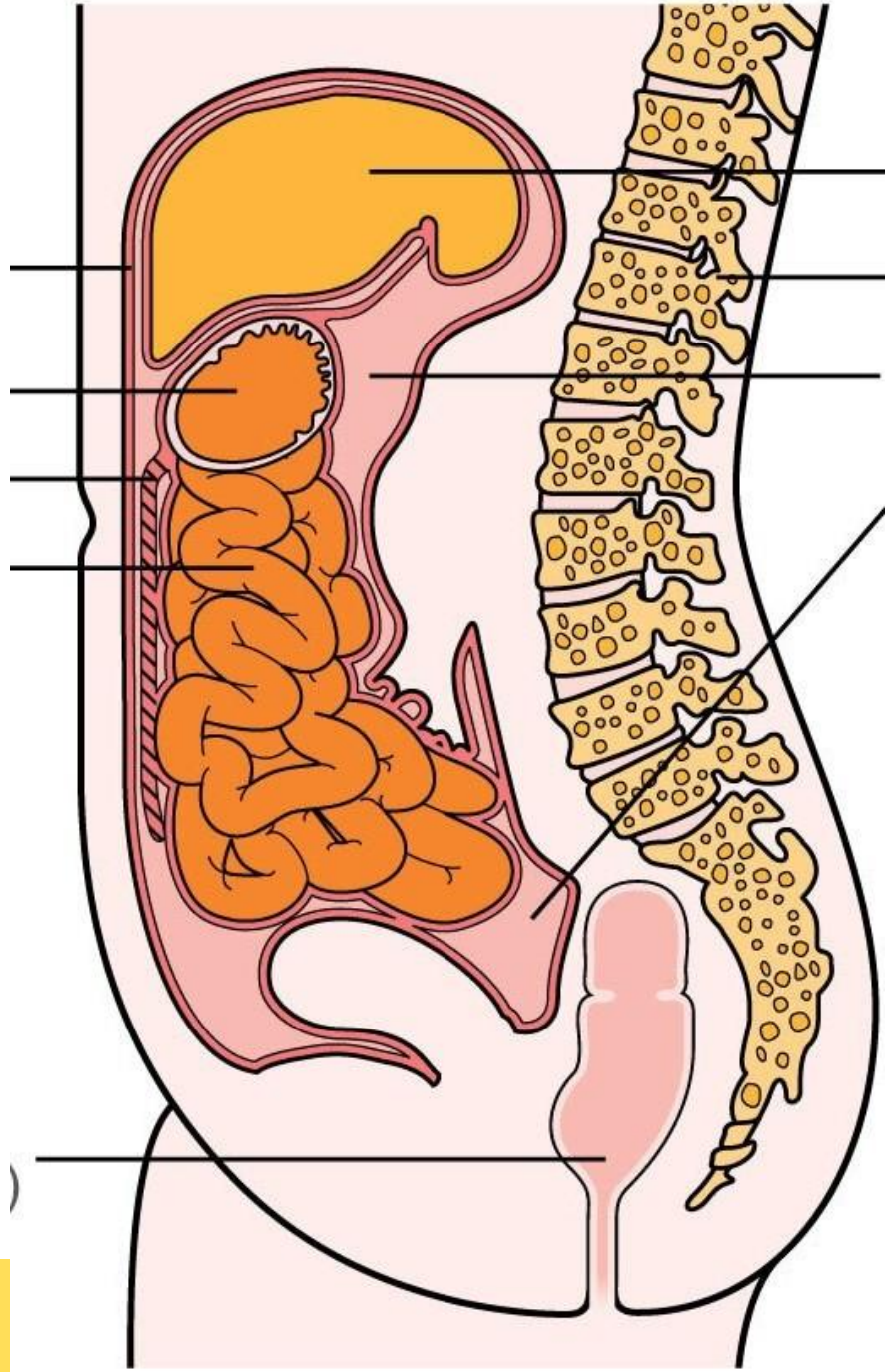
SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT OF PHYSICIAN ASSISTANT

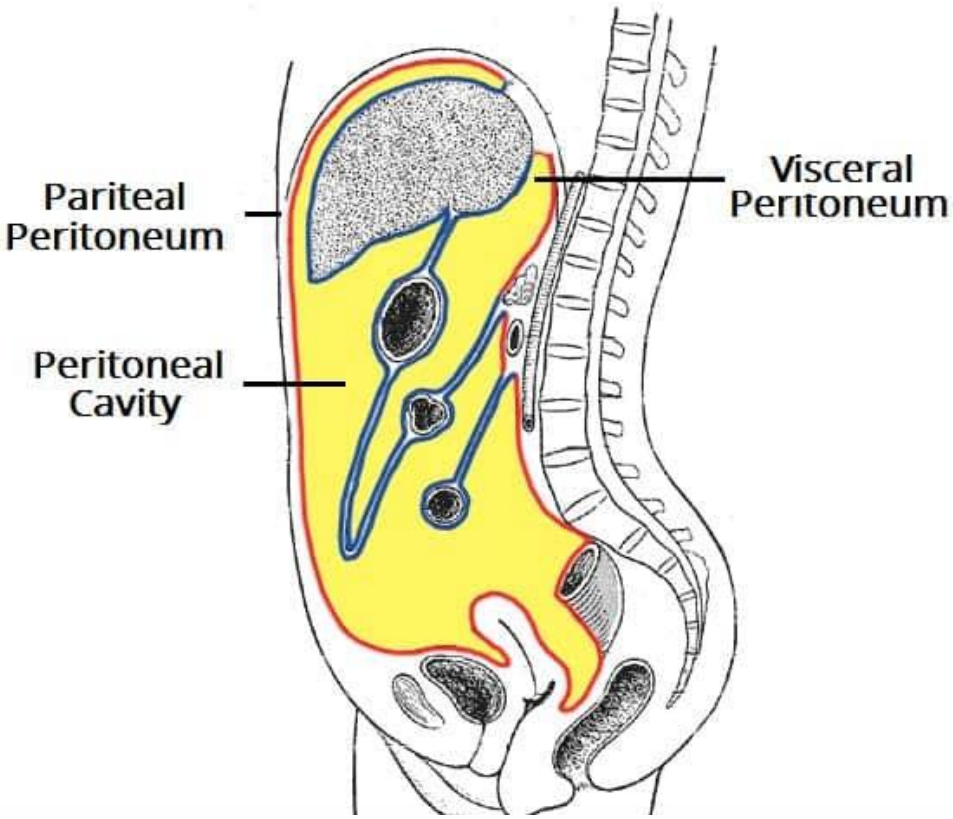
COURSE NAME: NEPHROLOGY

TOPIC : PERITONEAL DIALYSIS



Anatomy of Peritoneum

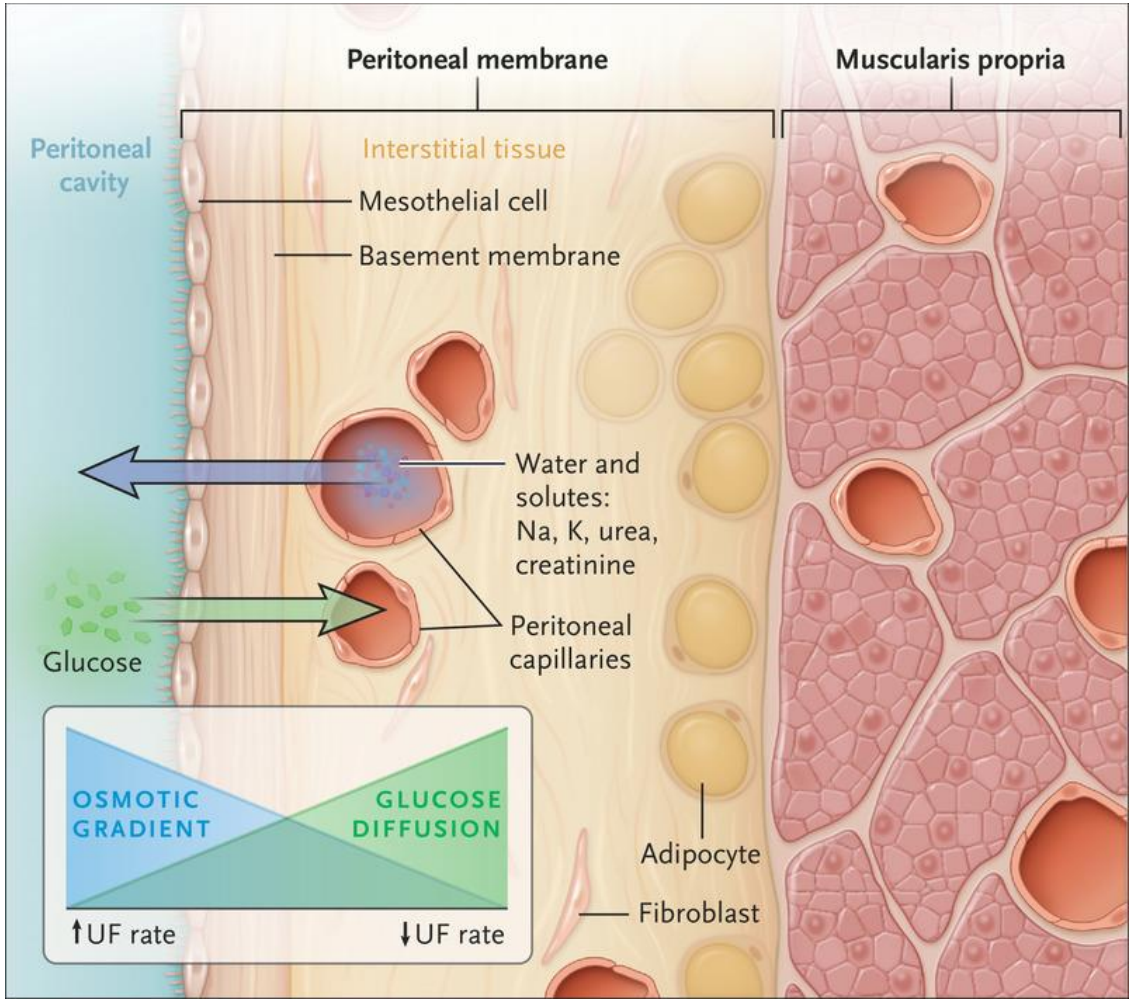
- Peritoneum is a layer that covers the abdomen
- It has two layers – Visceral and Parietal Peritoneum
- Histologically, the peritoneum consists of a single layer of mesothelial cells resting on sub-mesothelial interstitial tissue



Anatomy of Peritoneum

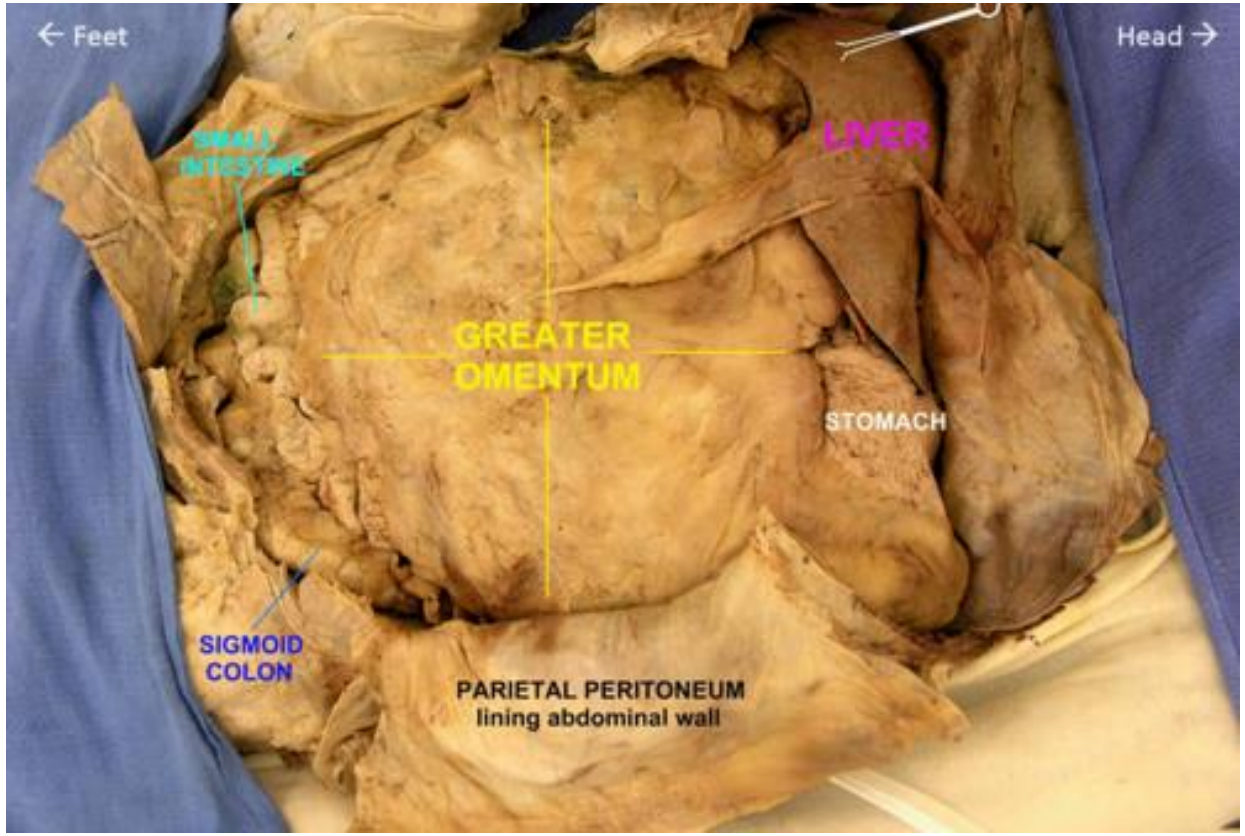
- The peritoneal layers consists of gel-like matrix containing fibroblasts, adipocytes, collagen fibers, nerves, lymphatic vessels, and capillaries

- The endothelium of the peritoneal capillaries functions as the filter that regulates peritoneal transport, so that suitable membrane for the performance of dialysis



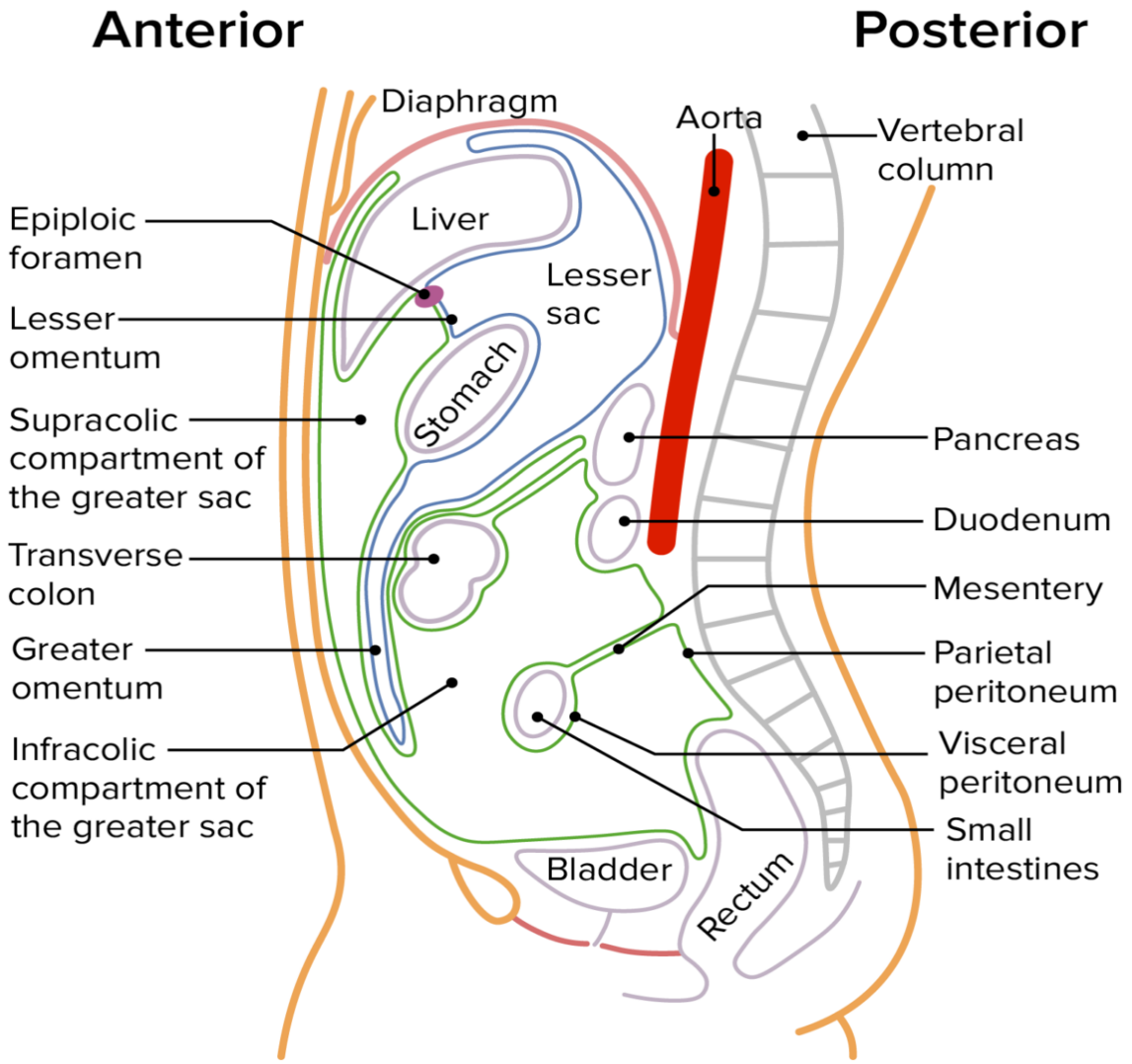
Functions of Peritoneum

- Supports and suspends the organs in their proper location within the abdominopelvic cavity
- Allows organs to move freely and smoothly
- Serves as a protective conduit for the neuro-vasculature supplying organs suspended within the cavity (e.g., protects arteries running from the aorta to the intestines)



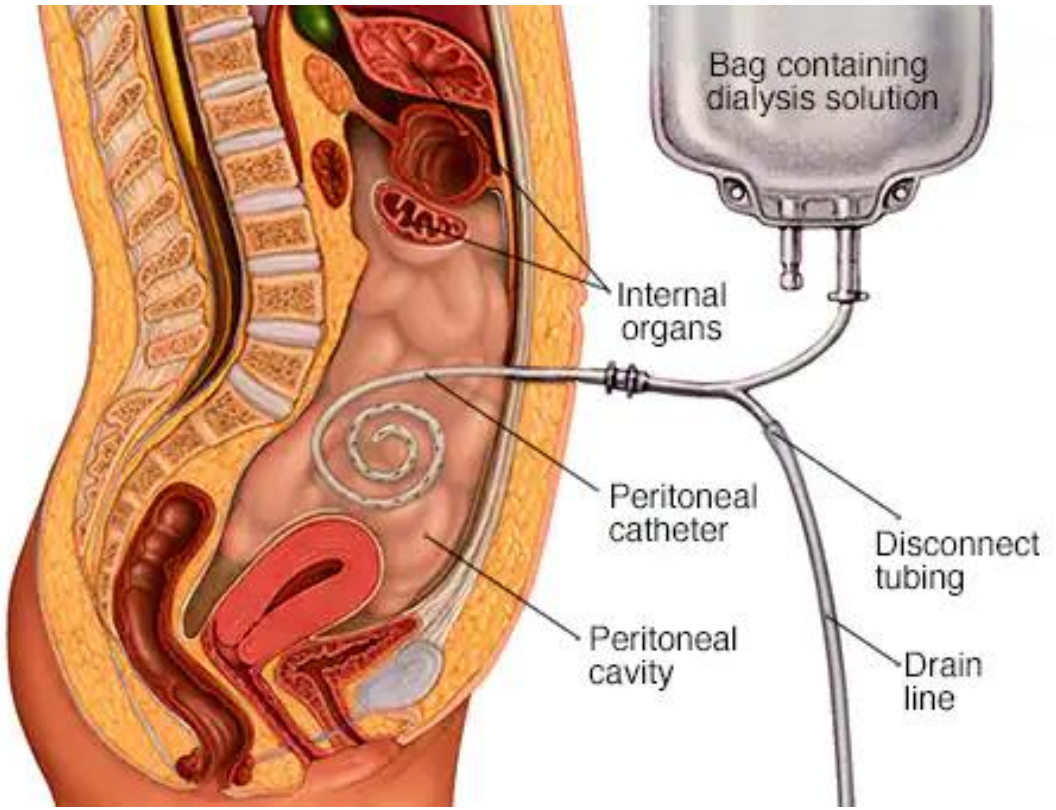
Compartments of Peritoneal Cavity

- The peritoneal cavity is divided into several different compartments by the omenta and transverse mesocolon:
- Greater sac:
  - Anterior portion of the cavity
- Lesser sac:
  - Located in the upper posterior portion of the abdomen
  - Communicates with the greater sac via the epiploic foramen, located on the free edge of the lesser omentum



Peritoneal Access

- This technique uses the patient own body (peritenum) as a natural filter
- A single-lumen, silicone rubber catheter is insterted through the abdominal wall.
- The tip is placed in the true pelvis
- The catheter is inserted through subcutaneous tissue, rectus abdominus muscle, peritoneal surface to the rectovesicle pouch.

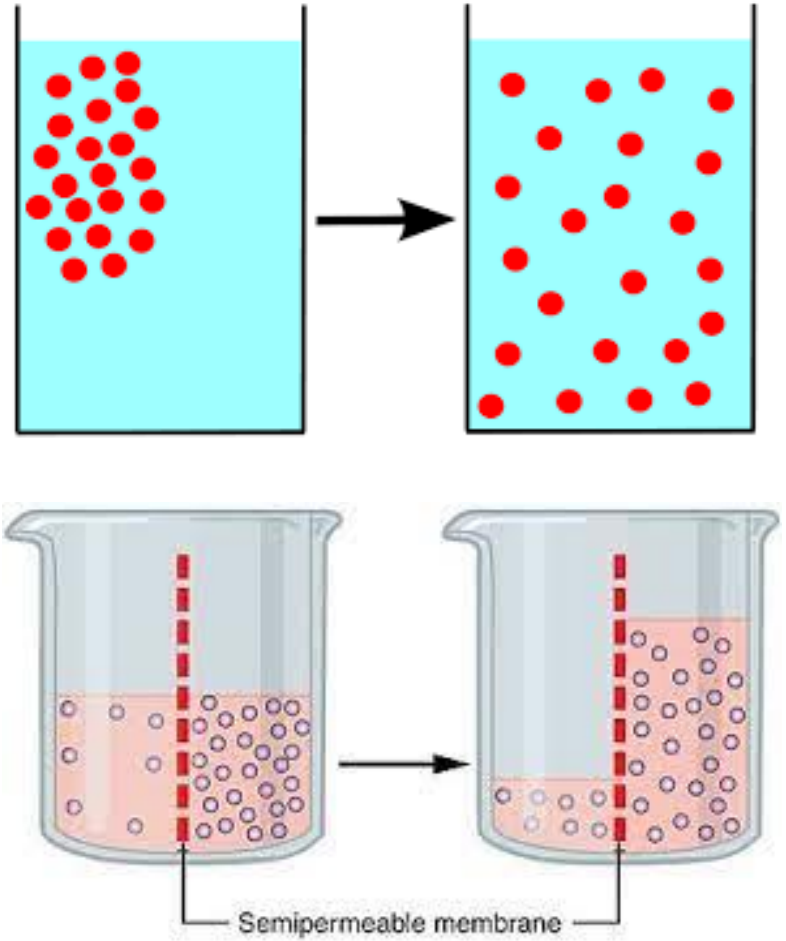


Goals of Peritoneal Dialysis

- Remove toxic substances and metabolic wastes
- Reverse the symptoms of uremia
- Re-establish normal fluid and electrolyte balance
- Maintain a positive nitrogen balance
- Prolong life
- Have the maximum level of quality of life

Process of Peritoneal Dialysis

- **Diffusion** is the movement of solutes from an area of greater concentration to an area of lesser concentration.
- **Osmosis** is the movement of fluid from an area of lesser concentration to an area of greater concentration of solutes.
- **Ultrafiltration** (water and fluid removal) results when there is an osmotic gradient or pressure gradient across the membrane



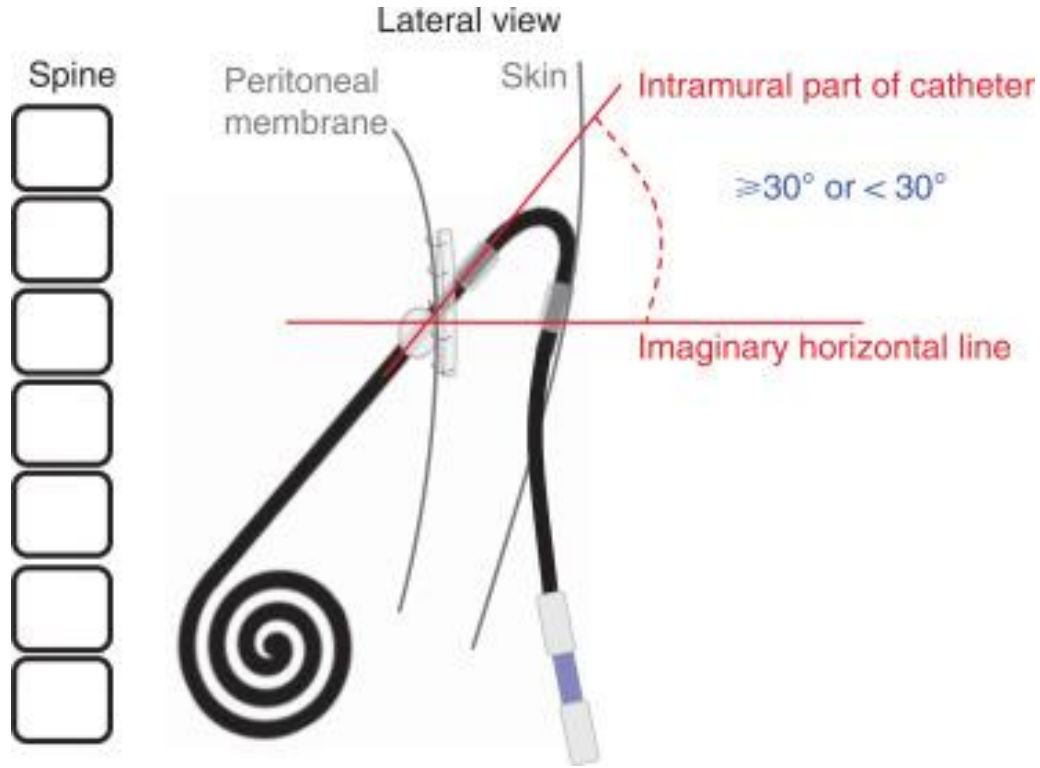
Contraindications

- Peritoneal fibrosis and adhesions following intra-abdominal operations
- Inflammatory gut diseases
- Hernias
- Significant loin pain
- Diverticulosis
- Colostomy
- Obesity
- Significant decrease of lung functions

PD Catheters

- Catheters for long-term use are usually made of silicone and are radio opaque to permit visualization on x-ray.

- These catheters have three sections:
- An **intraperitoneal section** with numerous openings and an open tip to let dialysate flow freely
- A **subcutaneous section** that passes from the peritoneal membrane and tunnels through muscle and subcutaneous fat to the skin
- An **external section** for connection to the dialysate section



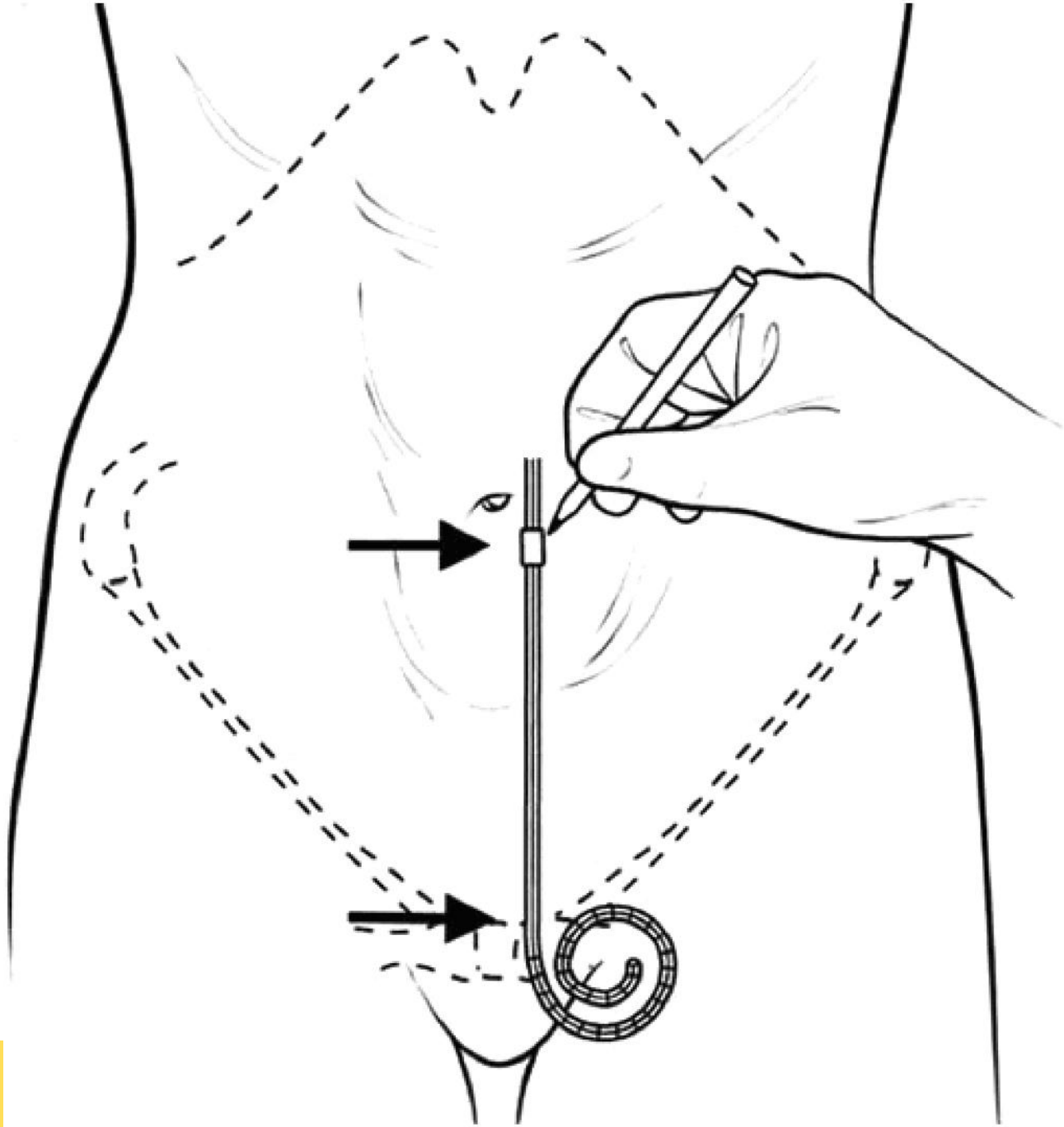
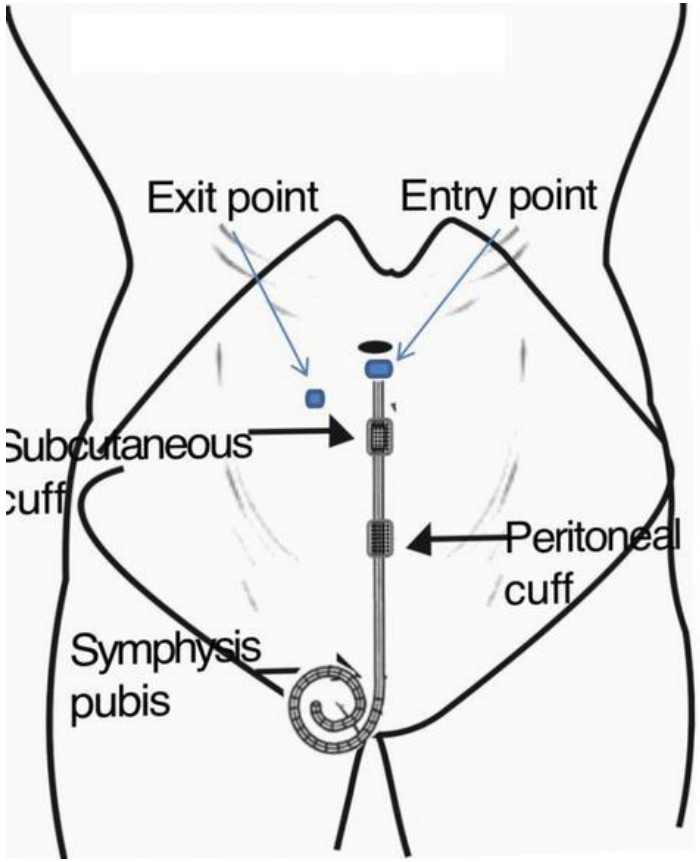


Fig. 2. Schematic illustration indicating the manner in which the catheter-insertion site and deep cuff location are selec

PD Catheters

- Catheters have two cuffs, which are made of Dacron polyester.
- The cuff stabilize the catheter **limit movement** **prevent leak** provide a barrier against microorganism
- **Cuff placement** : adjacent to the peritoneum, subcutaneously.
- The subcutaneous tunnel (5 to 10 cm long) further protects against bacterial infection



Types of Catheters

- It should give maximum inflow and output
- Discourage infection

Four main types

- Straight Tenckhoff
- Curled Tenckhoff
- Swan-neck
- T- fluted

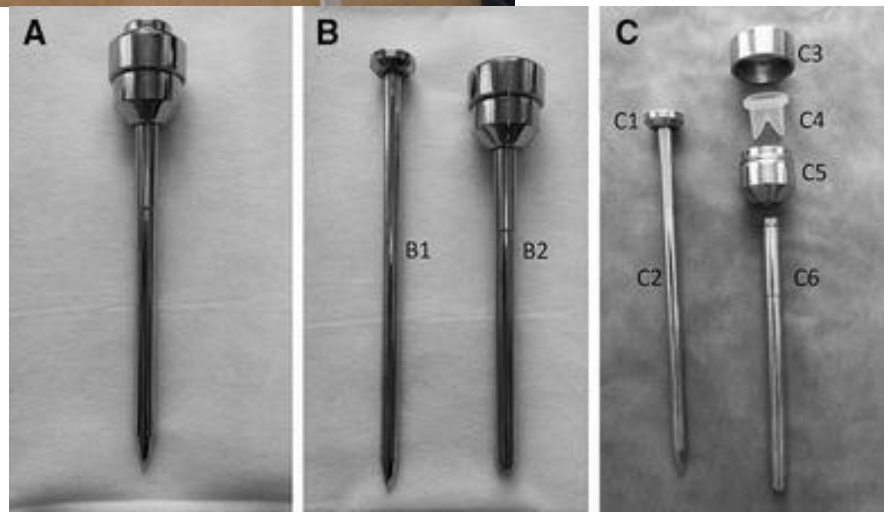
Standard Tenckhoff catheter

Swan-neck catheter

Coil catheter

Site of Insertion

- **Midline:** 3 cm below umbilicus
- **Lateral site:** At the lateral border of the rectus muscles.
- A trocar is used to puncture the peritoneum as the patient tightens the abdominal muscles by raising the head.
- The catheter is threaded through the trocar and positioned.



Composition of Dialysate

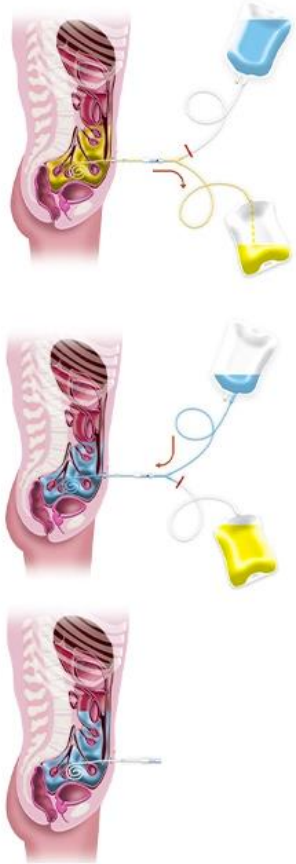
- Na -132 mmol/l
- Mg -0.5mmol/l
- Ca -1.25mmol/l
- CI -100mmol/l
- Lactate -35mmol/l
- Glucose -1.36-4.25g/dl
- Osmolarity -347-486
- Ph -5.2

Patient Preparation

- Take bath or have a shower
- Abdominal hair should be clipped
- Empty bowel and bladder before catheter insertion
- Enema can be given
- Staphylococcus aureus screening
- Assemble the equipment needed
- Check physician's order for the concentration of dialysate and medications to be added
- Heparin : to prevent clotting
- KCI: to prevent hypokalemia
- Antibiotics : to prevent peritonitis
- Insulin: for diabetic patients

Procedure

- **Warm the dialysate** solution to body temperature
- Dry heating should be done
- Too cold solution causes pain, cramping, and reduce clearance
- PD is accomplished by putting dialysis solution into the peritoneal space.

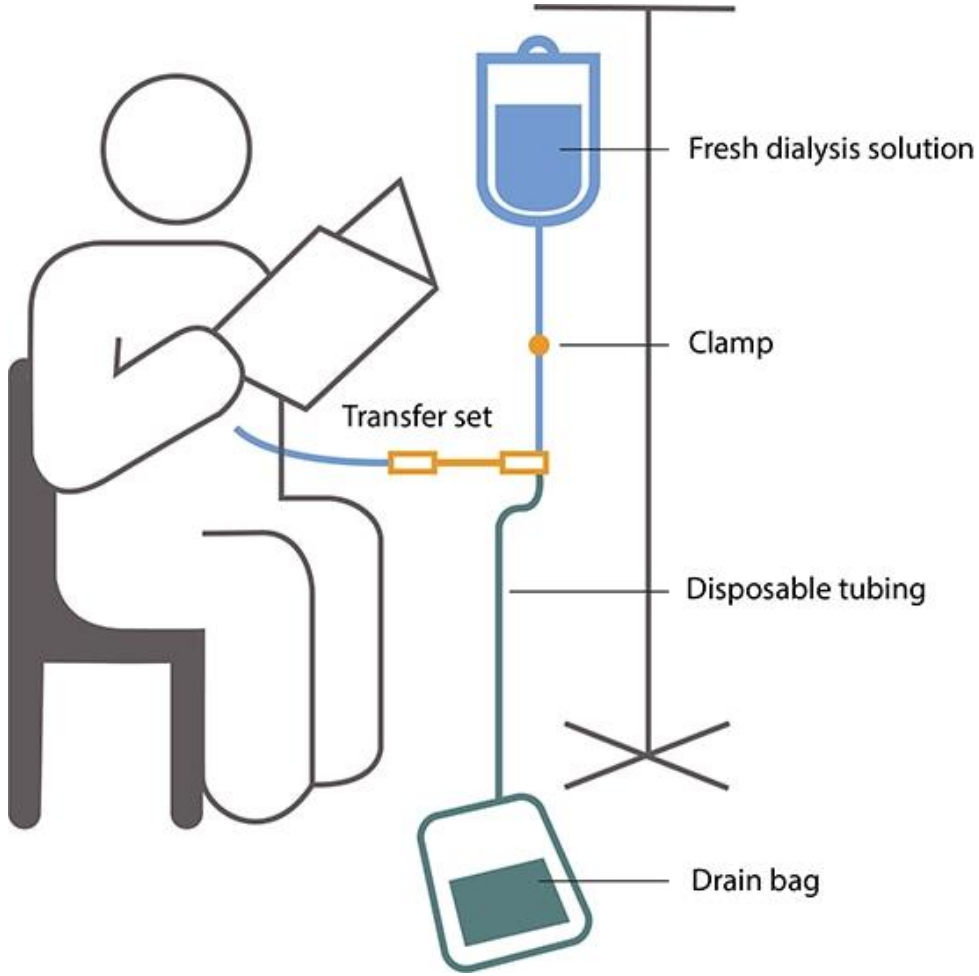


- The three phases of the PD cycle are **inflow (fill), dwell (equilibration), and drain.**
- The three phases are called an **exchange.**

Inflow

During inflow, a prescribed amount of solution, usually 2 L, is infused through an established catheter over about 10 minutes. The flow rate may be decreased if the patient has pain.

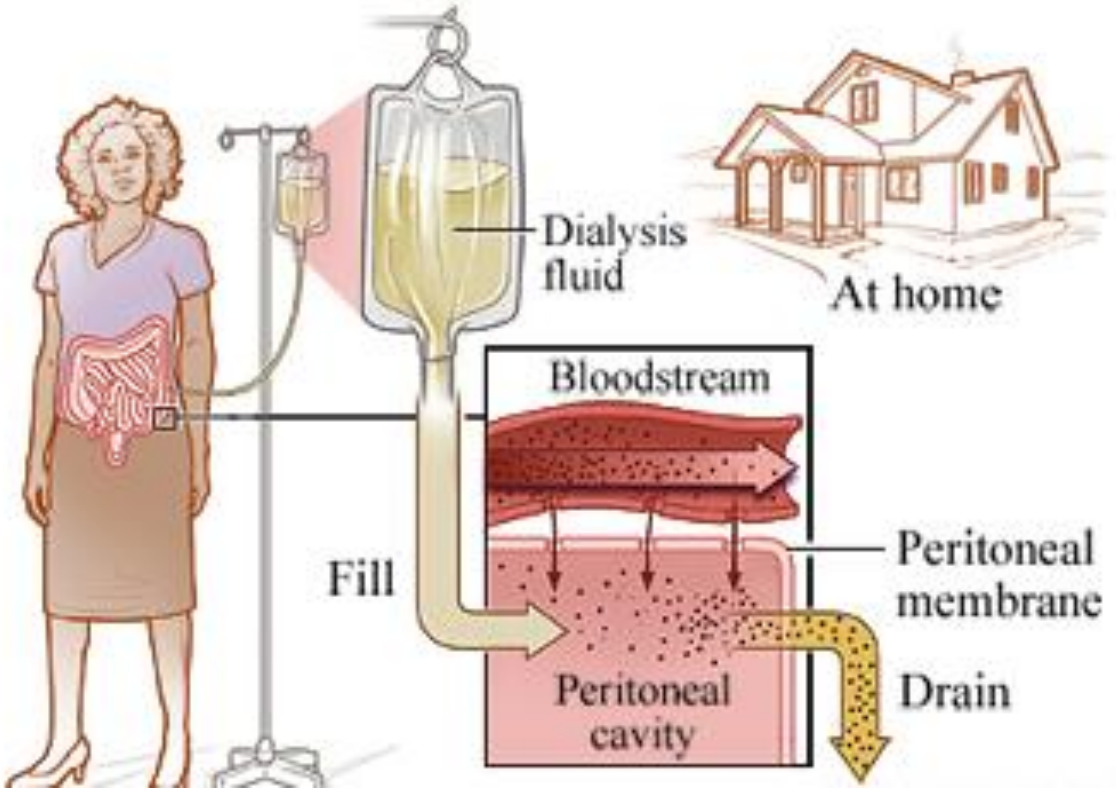
After the solution has been infused, the inflow clamp is closed before air enters the tubing.



Dwell

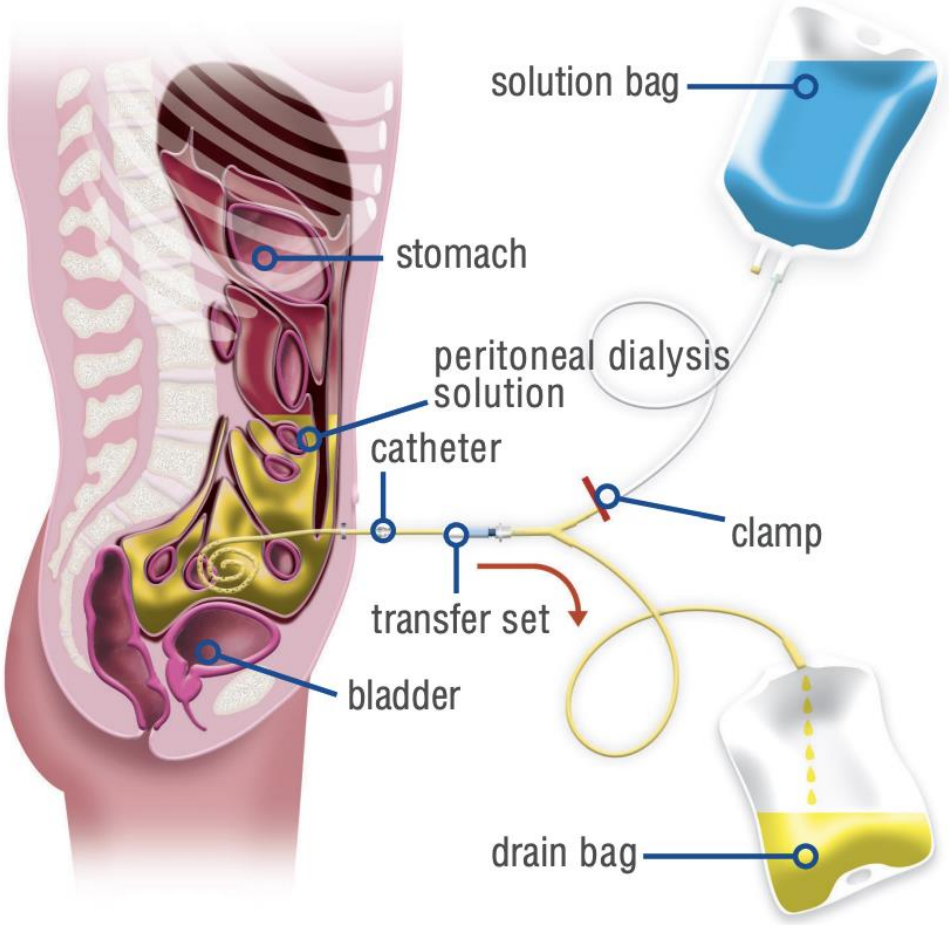
The next part of the cycle is the dwell phase, or equilibration, during which diffusion and osmosis occur between the patient's blood and the peritoneal cavity.

The duration of the dwell time can last from 20 or 30 minutes to 8 or more hours, depending on the method of PD.



Drain

- Drain time takes 15 to 30 minutes and may be facilitated by gently massaging the abdomen or changing position.
- The cycle starts again with the infusion of another 2 L of solution.
- For manual PD, a period of about 30 to 50 minutes is required to complete an exchange



Types of Peritoneal Dialysis

Continuous ambulatory peritoneal dialysis (CAPD)

Automated peritoneal dialysis (APD)

- Continuous cycling peritoneal dialysis (CCPD)
- Intermittent peritoneal dialysis
- Nocturnal(nightly)intermittent peritoneal dialysis

Continuous ambulatory peritoneal dialysis (CAPD)

- Continuous ambulatory peritoneal dialysis (CAPD) is done while the **patient is awake during the day.**

- Exchanges are carried out manually by exchanging 1.5 to 3 L of peritoneal dialysate at least four times daily, with dwell times averaging 4 hours

Automated peritoneal dialysis (APD)

- **Automated peritoneal dialysis (APD)** is the most popular form of PD because it allows patients to do dialysis while they sleep.
- An automated device called a **cycler** is used to deliver the dialysate for APD

- **Intermittent peritoneal dialysis** is offered to patients on a temporary basis when their blood pressure is low or in children with acute renal failure.

- **Noctural Intermittent peritoneal dialysis** Patient drains out fully at the end of the cycling period, so the abdomen is dry all day. • Clearances are lower

Advantage of PD Over HD

- Easy to use without sophisticated equipment
- Easy to manage in home and community health care facilities
- more independence and mobility
- Dialysis treatment of choice for children
- May allow better blood pressure and volume control with cardiovascular benefits
- May give better quality of life
- Lower risk of Hepatitis C
- Equal or better survival in early years

Complications

- Exit Site Infection.
- Peritonitis.
- Hernias.
- Lower Back Problems.
- Increased intraabdominal pressure can cause or aggravate lower back pain.
- Bleeding
- Pulmonary Complications. Atelectasis, pneumonia, and Bronchitis may occur from repeated upward displacement of the diaphragm, resulting in decreased lung expansion.
- Protein Loss: The amount of loss is usually about 0.5 g/L of dialysate drainage, but it can be as high as 10 to 20 g/day.