RENAL FAILURE
Acute Kidney Injury (AKI)
Chronic Kidney Disease (CKD)

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Renal failure

- Failure of the excretory function of the kidney
- As a result of depression of GFR
- Accompanied by variable degree of
  - Failure of erythropoietin production
  - Reduction of vitamin D hydroxylation
  - Alteration of acid base base balance
  - Alteration of salt and water balance
  - Increase in blood pressure

Acute Renal Failure – (AKI)

- Abrupt deterioration of renal function
- Usually reversible but not invariable
- Result accumulation of urea in blood
- Known as uremia
- Result reduction of urine output-Oliguria
- May result sudden life threatening biochemical abnormalities

Uraemia

- Accumulation of nitrogen waste product in serum
- Uraemia can be classified to
  - Pre renal
  - Renal
  - Post renal

Pre renal uraemia

- Result due to inadequate perfusion of kidneys
- Result from
  - Hypovlaemia
  - Hypotension
- Due to failure of auto regulation
- Leads parenchymal damage and progression to acute renal failure
- Improves with restoration of normal perfusion

Renal uraemia

- Due to parenchymal damage
- Commonly due to tubular damage
- Known as acute tubular necrosis
- Other causes include
  - Severe hypertension
  - Glomerular damage due to glomerulonephritis

Post renal uraemia

Result due to obstruction of outflow track

Life threatening problems of acute renal failure

- Hyperkalaemia
  - Result cardiac arrhythmias
  - Needs urgent treatment
    - Intravenous calcium
    - Insulin glucose infusion
    - Dialysis
- Pulmonary oedema
  - Due to fluid accumulation
  - Treatment
    - Loop diuretics
    - Dialysis

Biochemical disturbances of acute renal failure

- Uraemia
- Hyperkalaemia
- Metabolic acidosis

Chronic renal failure - CKD

- Implies impairment of renal function which
  - Long standing
  - Progressive

Chronic renal failure - CKD

- Leads to accumulation of numerous metabolites
- Symptoms are common when urea concentration exceeds 40mmol/l
- Symptoms of renal failure
  - Constitutional symptoms
    - Malaise, loss of appetite
  - Nausea, Vomiting
  - Itching
  - Bone pain
  - Symptoms of anaemia
  - Endocrine problems

Chronic renal failure - CKD

- Sings
  - Pallor
  - Pigmentation
  - Scratch marks
  - Sings of fluid overload

Chronic renal failure - CKD

- Investigation
- Serum biochemistry
  - Urea and creatinine
  - Electrolytes
- Urine biochemistry
  - Urinalysis-Proteinuria , Haematuria
  - Urine microscopy for
    - Cells – dysmorphic
    - Casts

Complication of chronic renal failure-CKD

- Due to depression of renal parenchymal function
  - Reduction of erythropoietin production
  - Reduction of 1 alpha hydroxylase activity

Complication of chronic renal failure-CKD

- Anaemia
- Multifactorial
  - Reduction of erythropoietin level
  - Suppression of bone marrow by toxins
  - Deficiency of haematinics
  - Increased red cell breakdown
  - Increase loss – most from GI track

Complication of chronic renal failure-CKD

- Renal osteodystrophy
- Reduction of 1 alpha hydrolase
- Reduction of metabolically active vitamin D
- Result
  - Gut calcium malabsorption
  - Increase PTH secretion
    - Reabsorption of calcium from bone
    - Retention of phosphate
    - Increase osteoclastic activity – cyst formation and fibrosis bones

Management of chronic renal failure

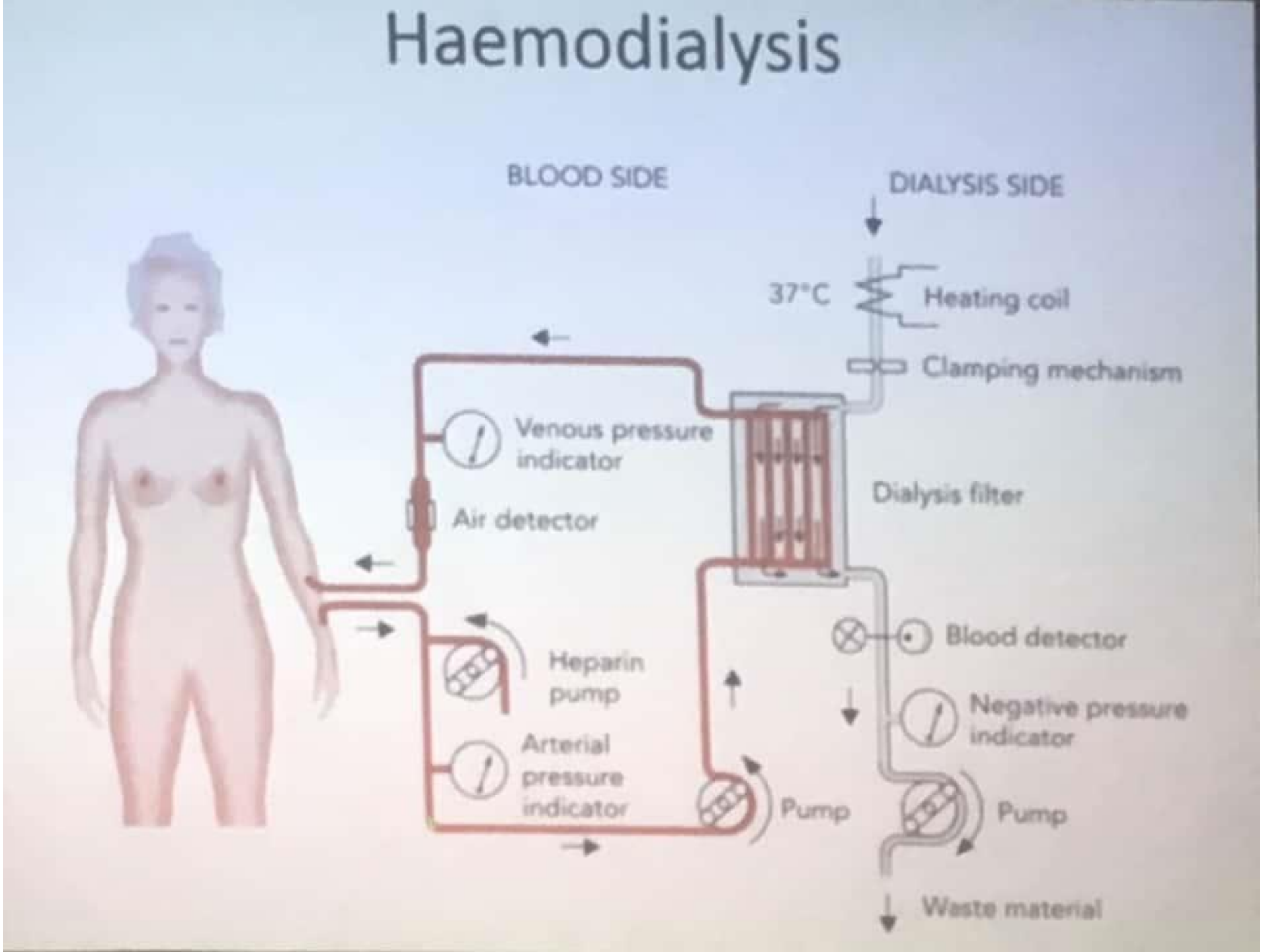
Renal replacement therapy

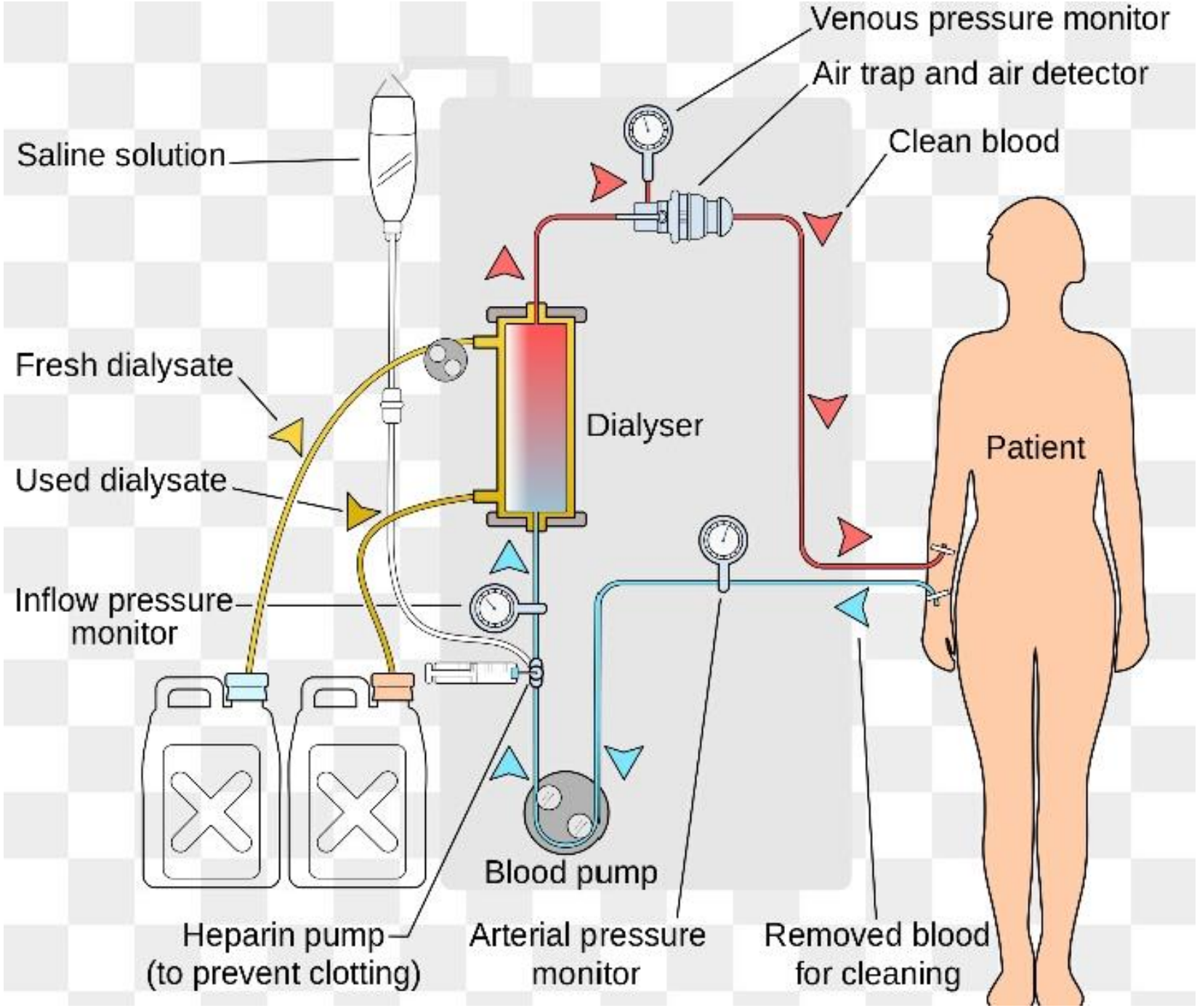
1. Dialysis
   - Hemodialysis
   - Peritoneal dialysis
2. Renal transplant

Hemodialysis

- Blood is pumped through the artificial kidney dialyzer
  - An array of semi permeable membranes
- Brings the blood in to close contact with dialysis
  - Dialysate-the fluid used to do dialysis
- Blood and dialysate flow counter currently
- The molecules move according to the concentration gradient

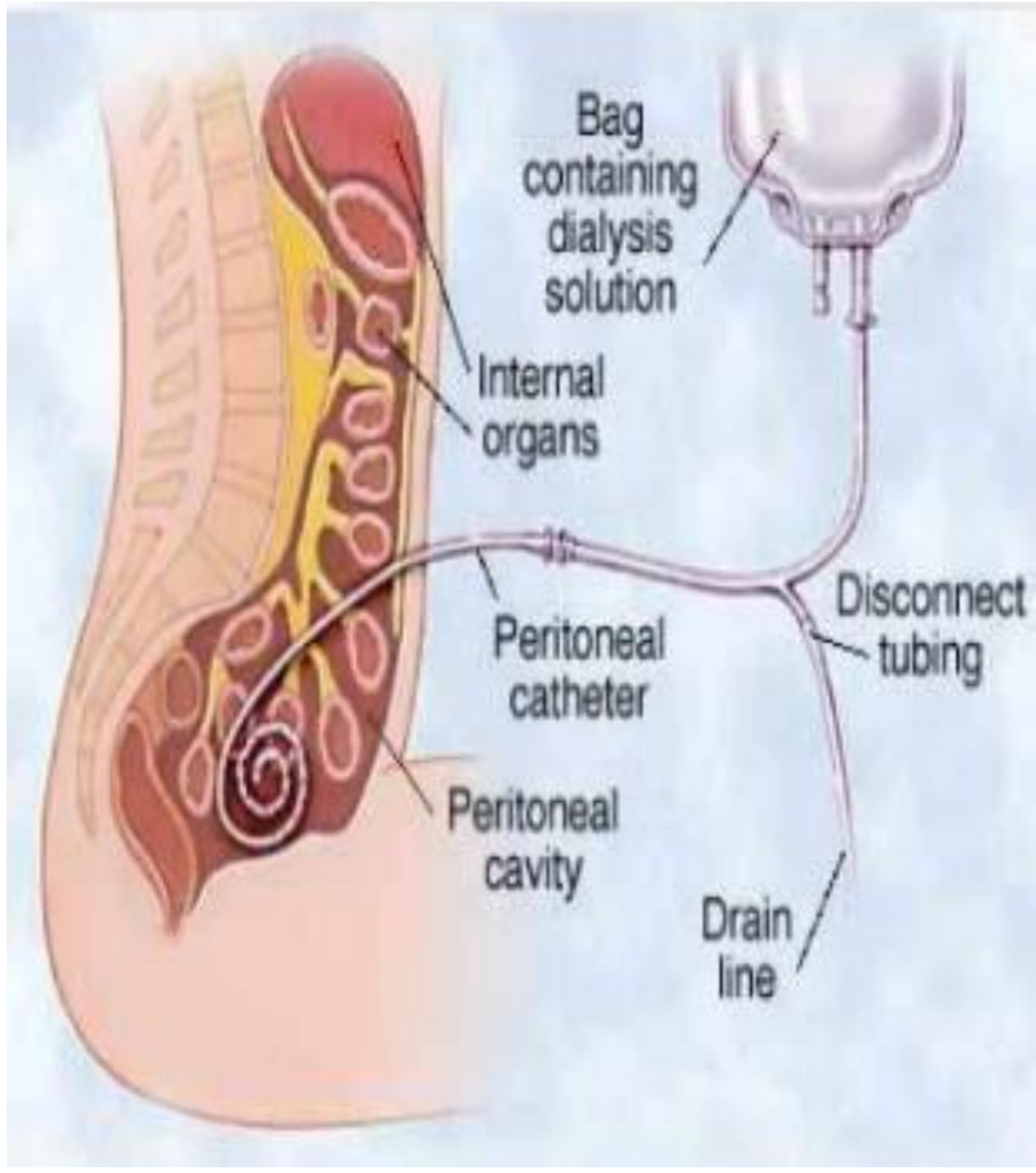
Haemodialysis




Venous pressure monitor
Air trap and air detector
Clean blood
Saline solution
Fresh dialysate
Used dialysate
Dialyser
Patient
Inflow pressure monitor
Blood pump
Heparin pump (to prevent clotting)
Arterial pressure monitor
Removed blood for cleaning

Peritoneal dialysis

- Utilize the peritoneal membrane as a semipermeable membrane
- A tube is placed in to the peritoneal cavity
- Dialysate runs in to the cavity
- Urea, creatinine, potassium, phosphate and other products passes from peritoneal capillaries to dialysate
- The dialysate is removed regularly and the process is repeated


Bag containing dialysis solution
Internal organs
Peritoneal catheter
Disconnect tubing
Peritoneal cavity
Drain line