

DIALYSIS

INDICATIONS FOR DIALYSIS

A - acidosis

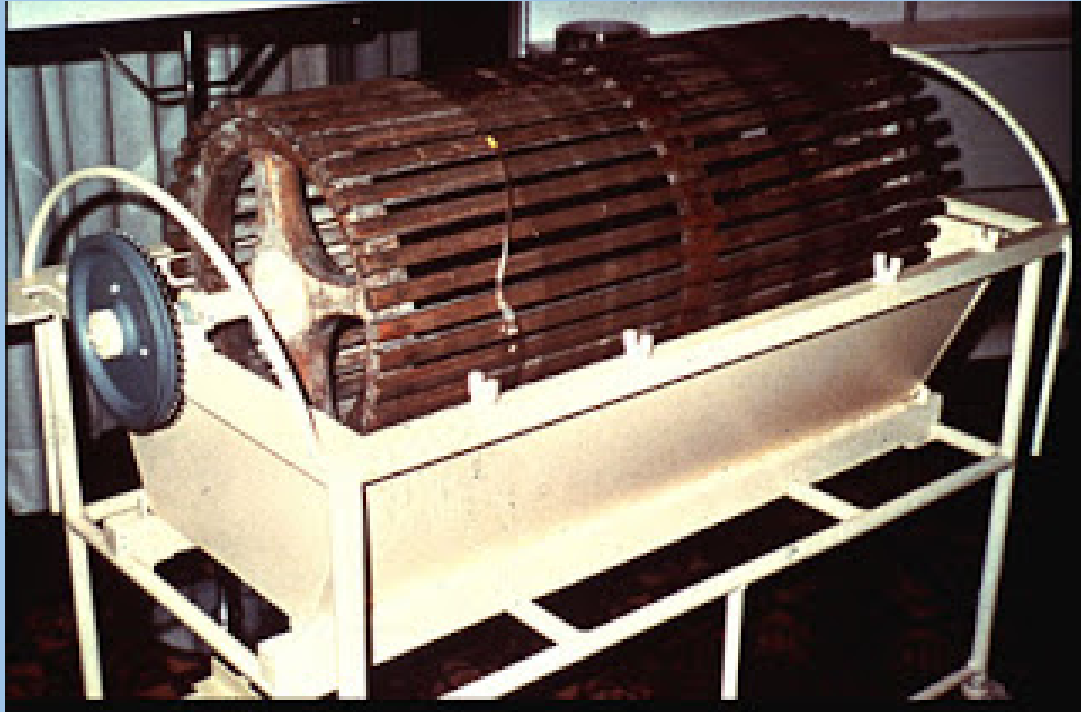
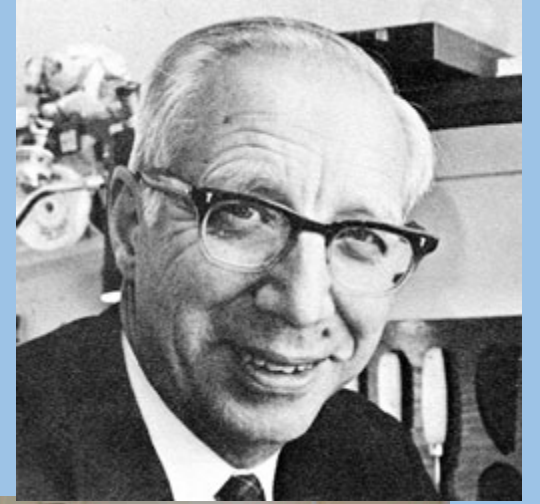
E - electrolytes

I - ingestions

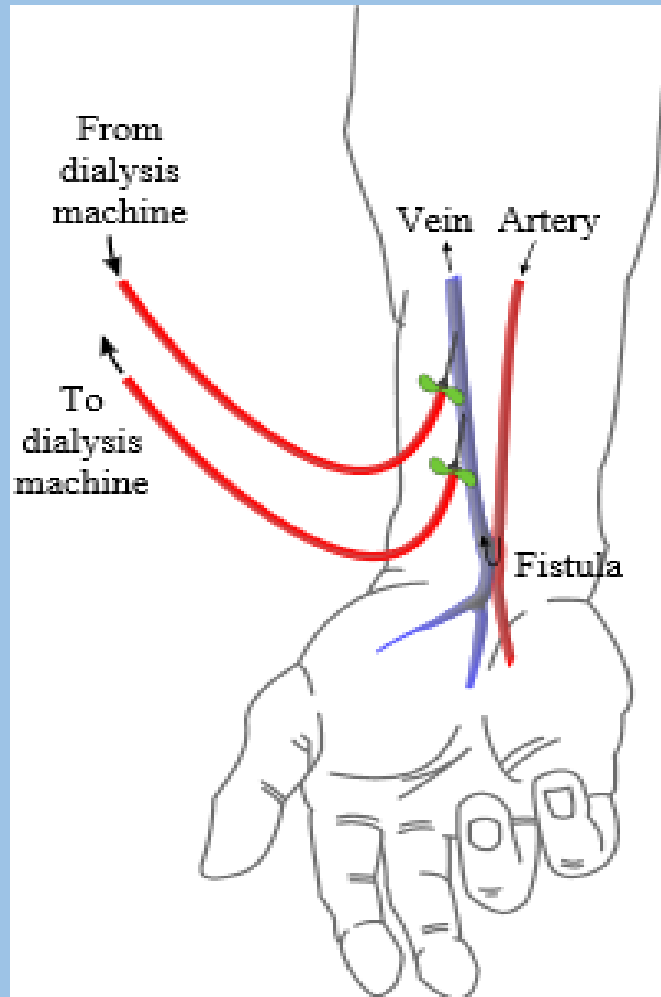
O - overload

U – uremia (confusion, pericarditis, seizures, plt dysfunction, vomiting, anorexia, pruritis)

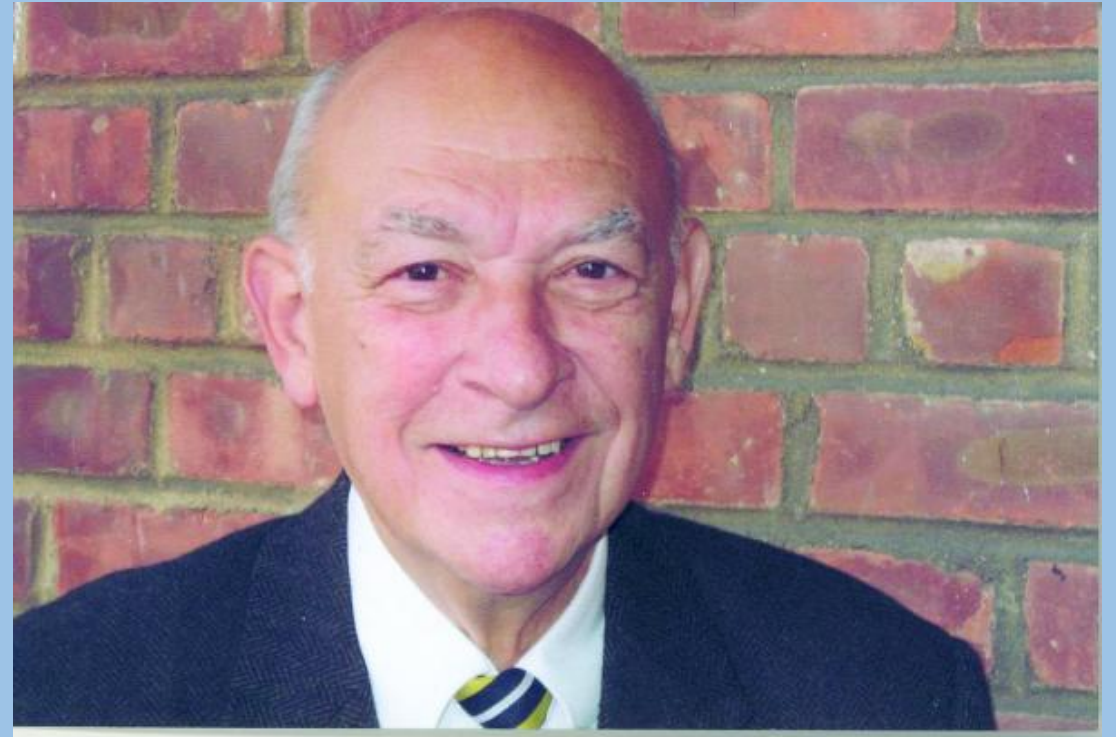
HISTORY OF HEMODIALYSIS: rotating drum kidney



AV fistula enabled long term dialysis



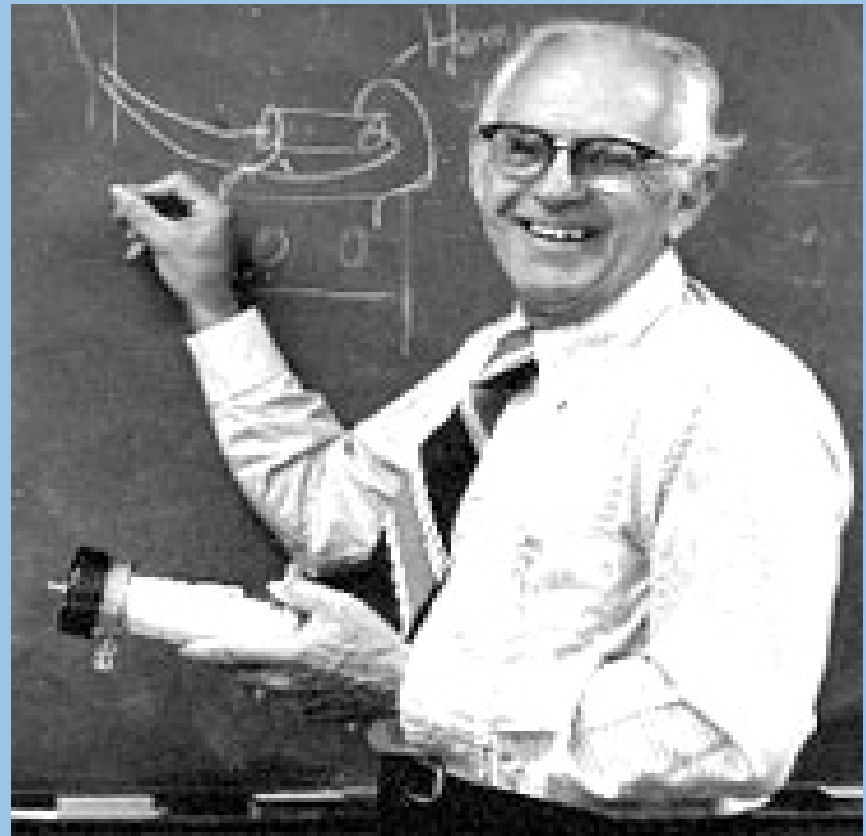
- James Cimino



Outpatient Dialysis

- 1st outpatient HD unit was established in Seattle
 - Seattle Artificial Kidney Center
- Committees would determine who would be eligible for dialysis
- In 1972 Social Security Amendment added kidney entitlement

- Belding Scribner

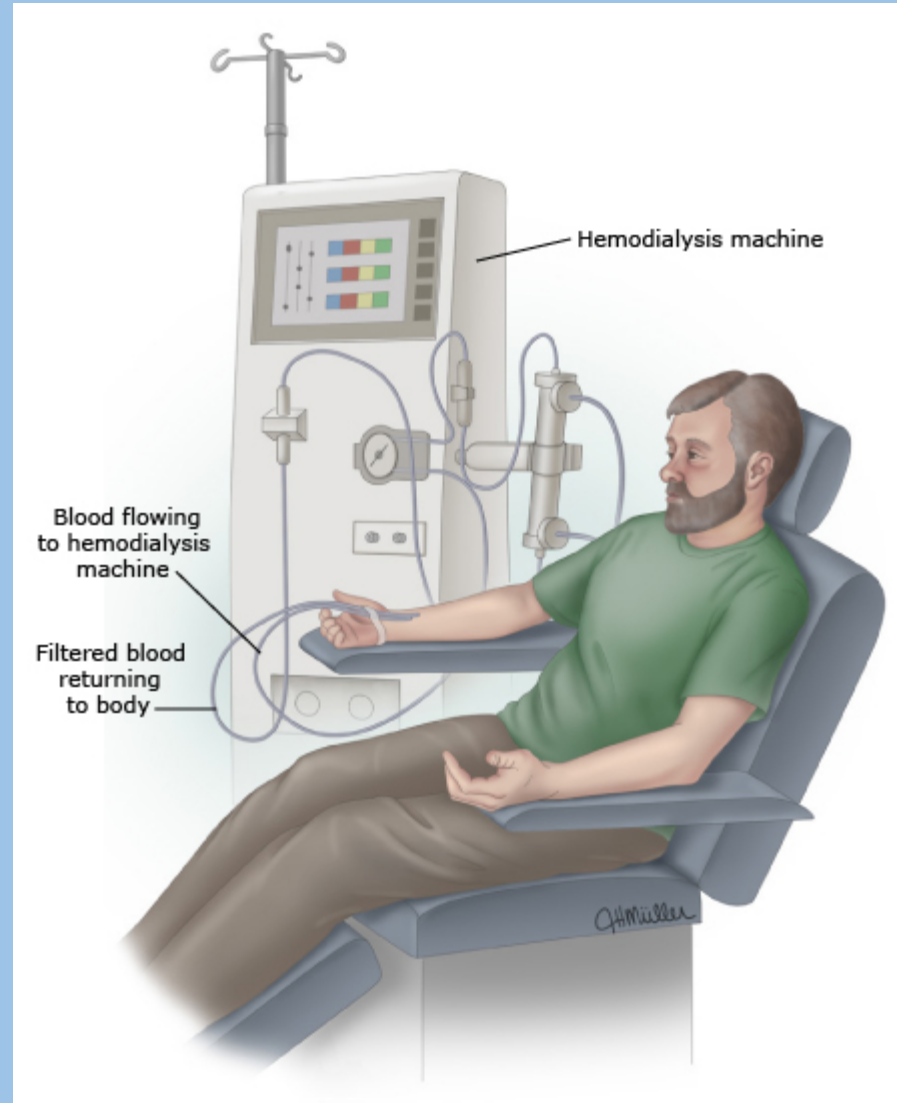


MODERN HEMODIALYZER

- Several thousand parallel hollow filters
- Total surface area: 0.5-2.0m²

Hemodialysis

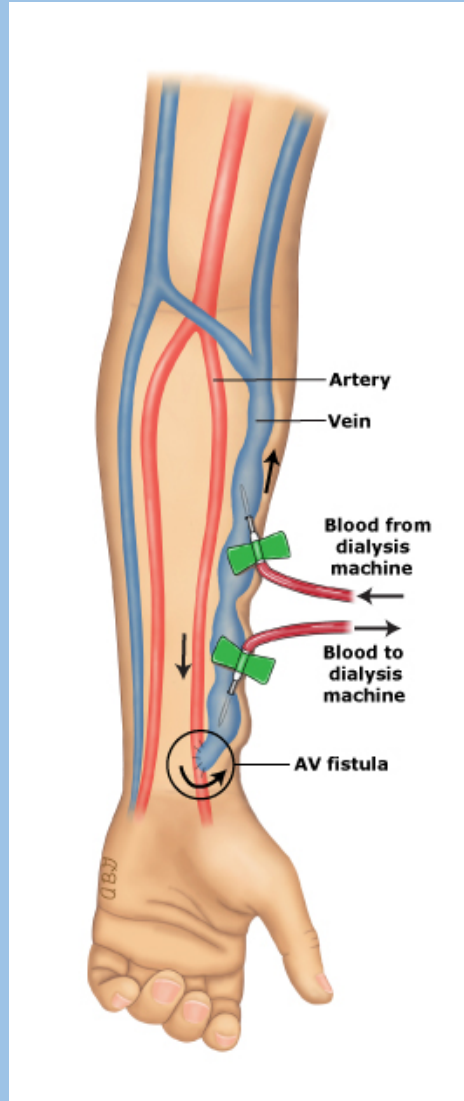
- 2 needles are placed in an “access” in the arm
- Blood flows to the dialysis machine, is filtered and is returned to the body
- 3-5 hours, 3-7 times per week



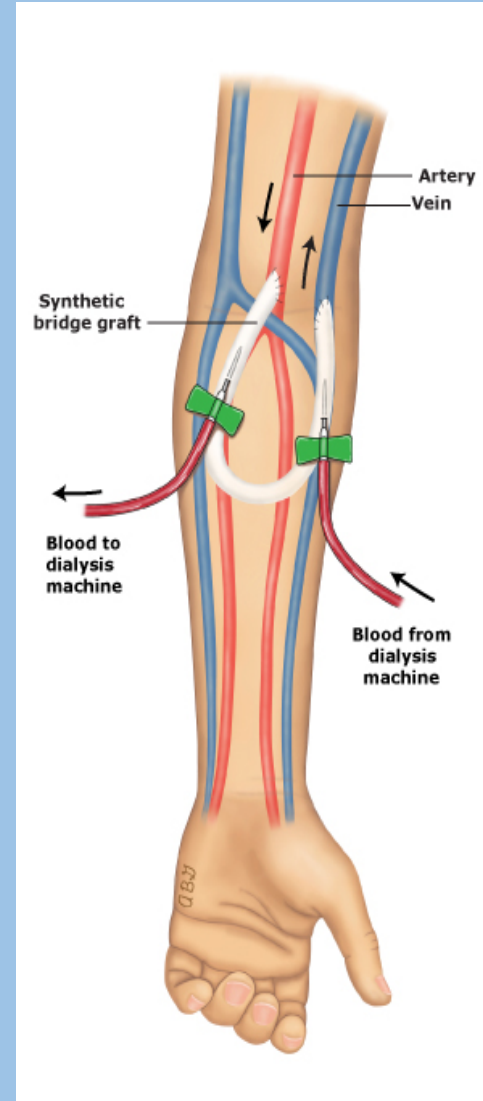
Renal Replacement Therapy: types of clearance

- Hemodialysis uses Diffusion
- Hemofiltration uses convection
 - Movement of solutes across a larger bore hemofiltration drags along solutes that are dissolved in the water that is crossing
 - Thus fluid removal is required for solute clearance

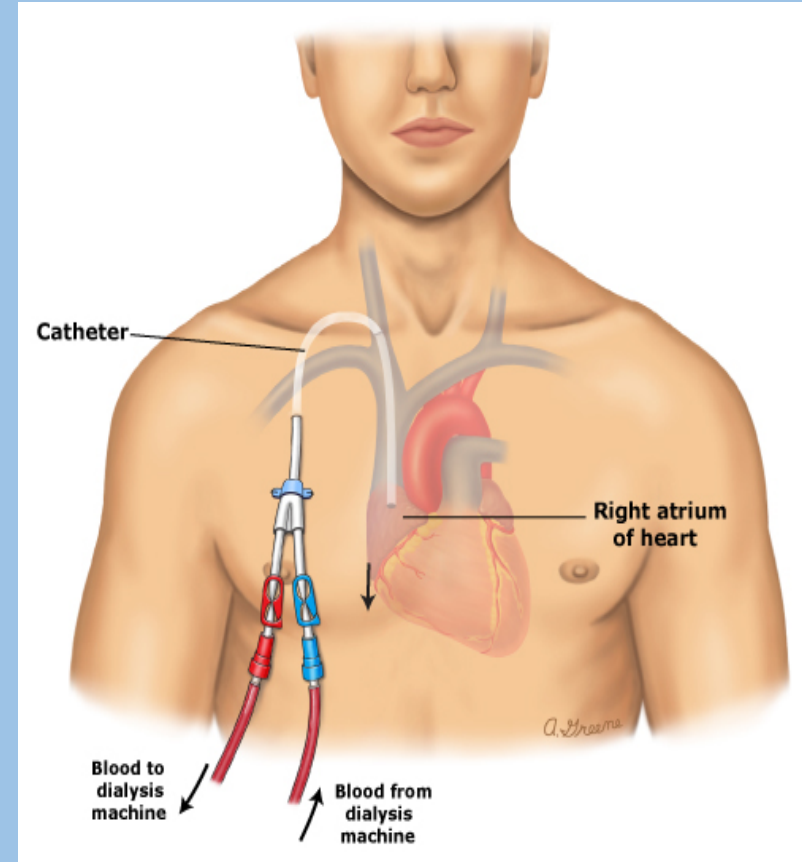
AV fistula



AV graft

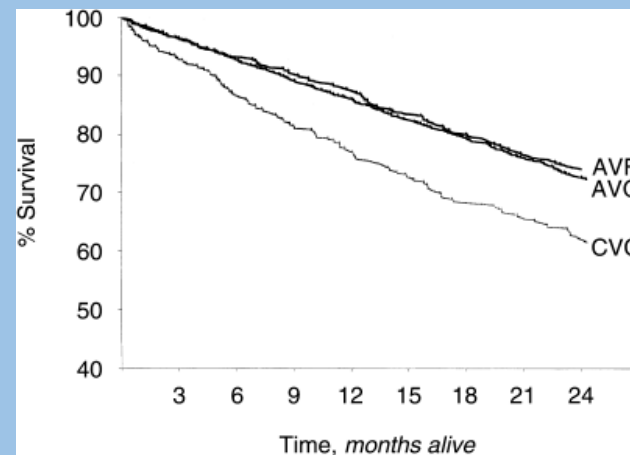
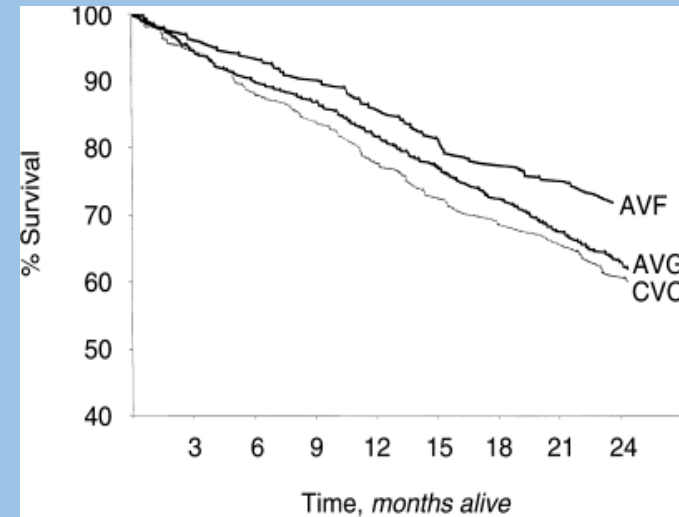


Central Venous Catheter



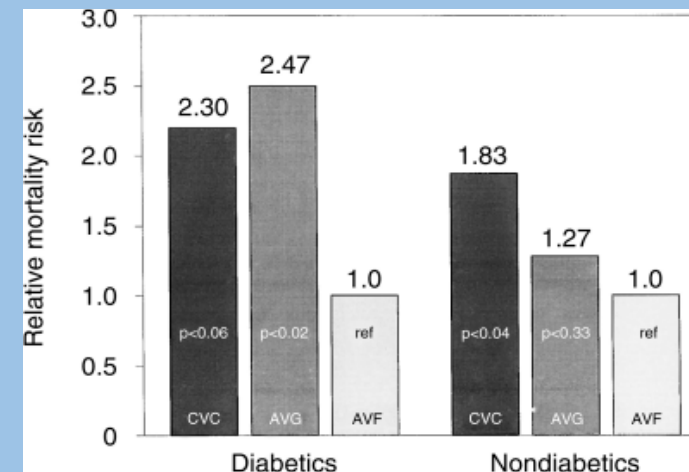
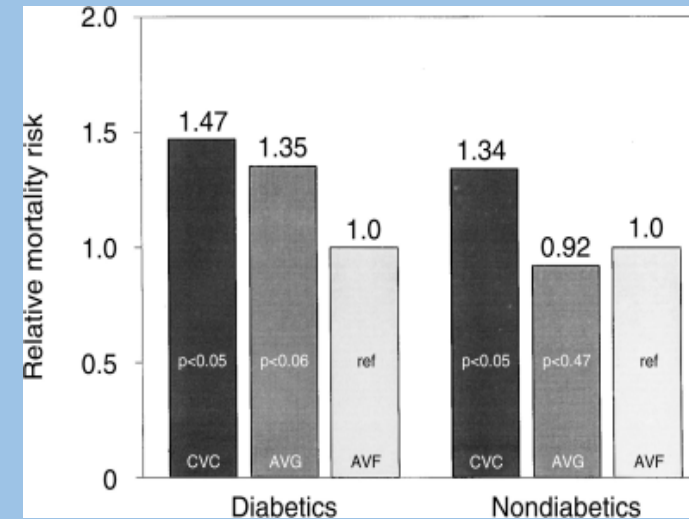
Mortality & Vascular Access

- % Survival in diabetics (top) and non-diabetics (bottom)
- AVF has significantly less mortality



Mortality & Vascular Access

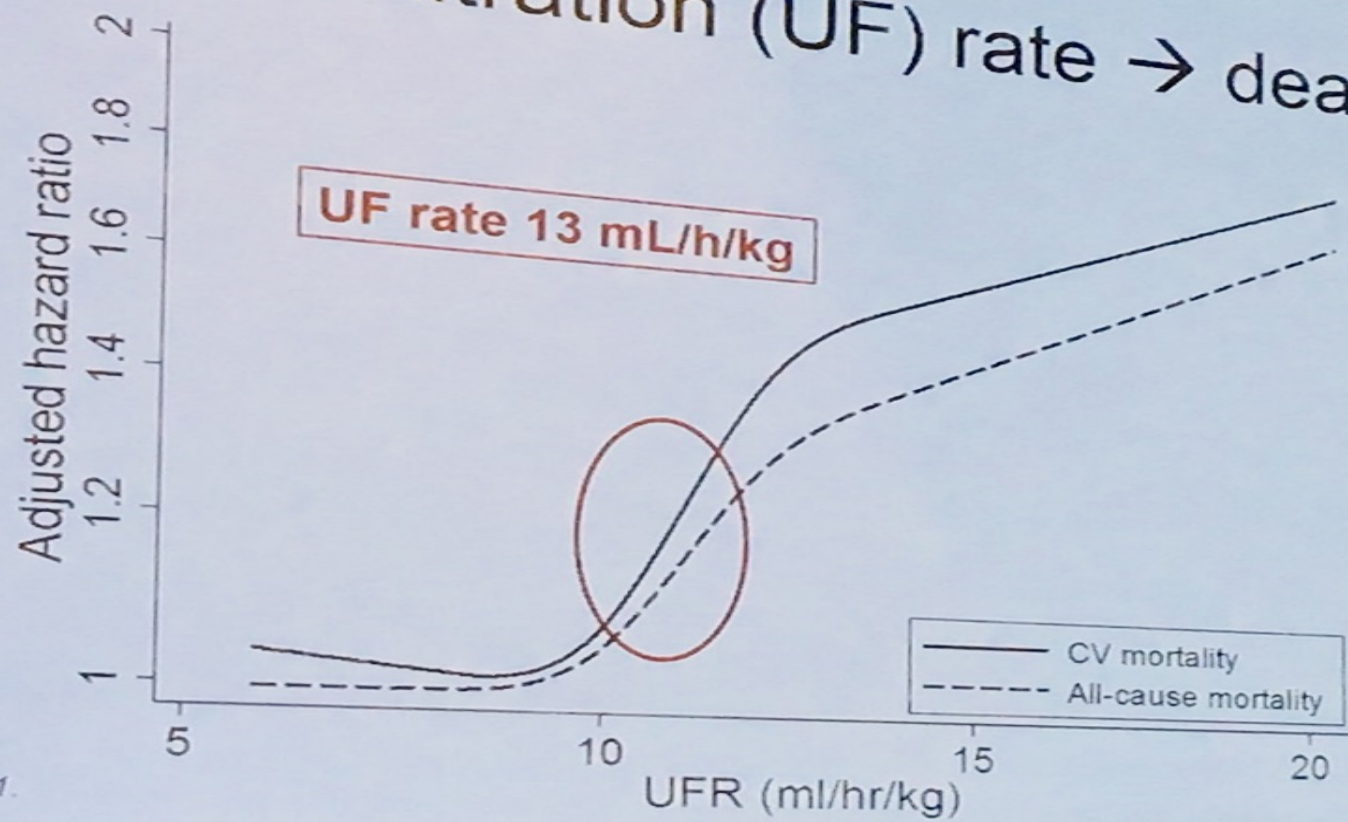
- Adjusted relative risk of death due to cardiac causes (above) and infection (below)
- AVF has significantly less mortality for both causes



Acute Complications of Hemodialysis

- Hypotension
- Dialysis Dysequilibrium Syndrome
 - Reduction in plasma osmolality causes transient osmotic gradient that may cause water to move into brain cells
 - Headache, nausea, confusion, seizures, coma, death, anorexia
 - Prevention with slow dialysis in uremic patients
 - Some physicians use mannitol
- Hemolysis
- Air embolism
- Arrhythmias

High ultrafiltration (UF) rate \rightarrow death

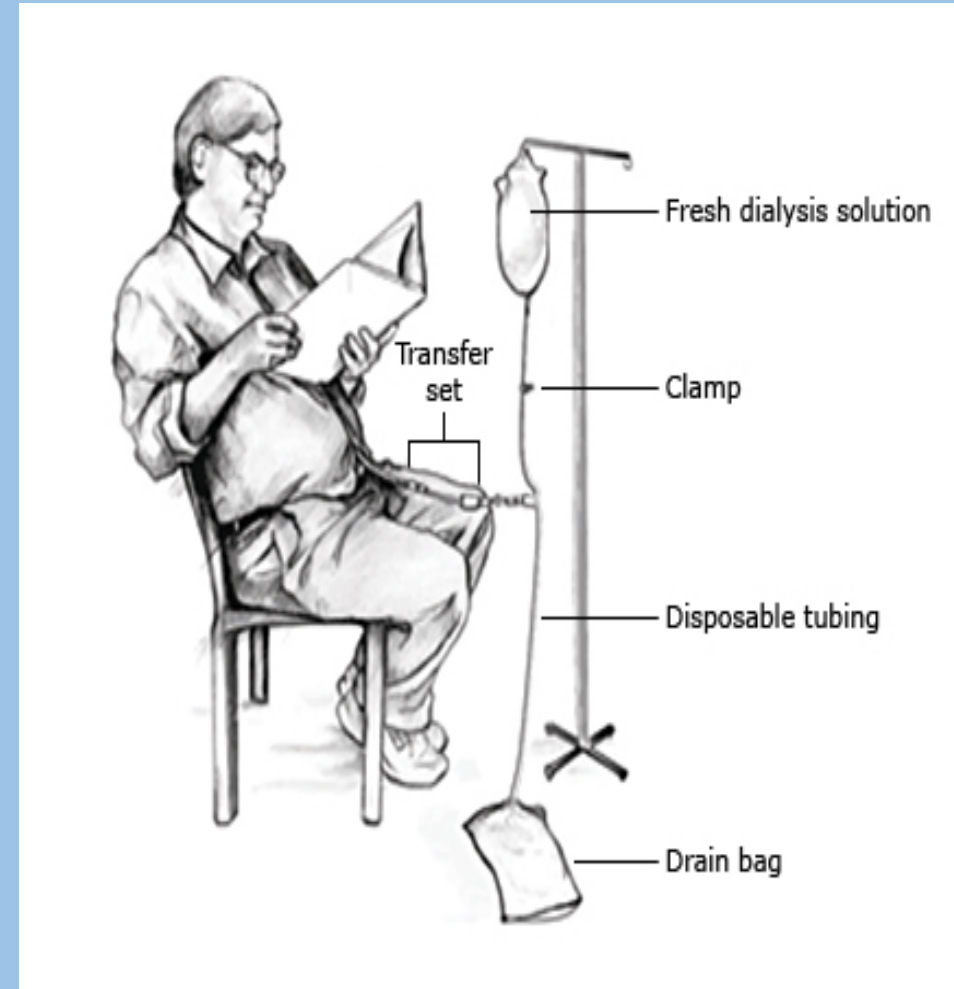


PERITONEAL DIALYSIS

- Solute moves across the peritoneal membrane from diffusion and convection
- Fluid moves across the peritoneal membrane due to osmotic gradient

Peritoneal Dialysis

- Fresh dialysis solution flows into the person's belly
- It stays there for a period of time and then is drained into a drain bag
- A transfer set connects the catheter in the person's belly to the dialysis equipment



PERITONEAL EQUILIBRATION TEST

- 2L dialysate infused and left to dwell for 4 hours
- Dialysate to plasma creatinine ratio is measured to assess how fast solutes move
- High transporter: >0.81
 - Rapid clearance of small molecules but poor ultrafiltration because glucose also moves rapidly across membrane
 - Need short-dwell PD regimens to achieve fluid removal
- High average transporter: 0.65-0.81
- Low average transporter: 0.50-0.65
- Low <0.5
 - Low clearances for solutes but adequate ultrafiltration
 - Need increased volume and number of exchanges to prevent uremia

ULTRAFILTRATION FAILURE

- 2L OF 4.25g/dL glucose dialysate is left to dwell for 4 hours
 - If effluent is <2400ml, there is inadequate ultrafiltration

PD ADEQUACY

- Kt/V
 - K=urea clearance, t=time, v = total body water (0.6 x wt in males, 0.55 x wt in females)
 - [(dialysate:plasma_{urea} x 24hr effluent drain volume) + 24hr urine urea clearance] x 7 (to get weekly clearance)
 - Goal 2.0 Kt/V
 - Goal weekly CrCl 60L

PD COMPLICATIONS: Peritonitis

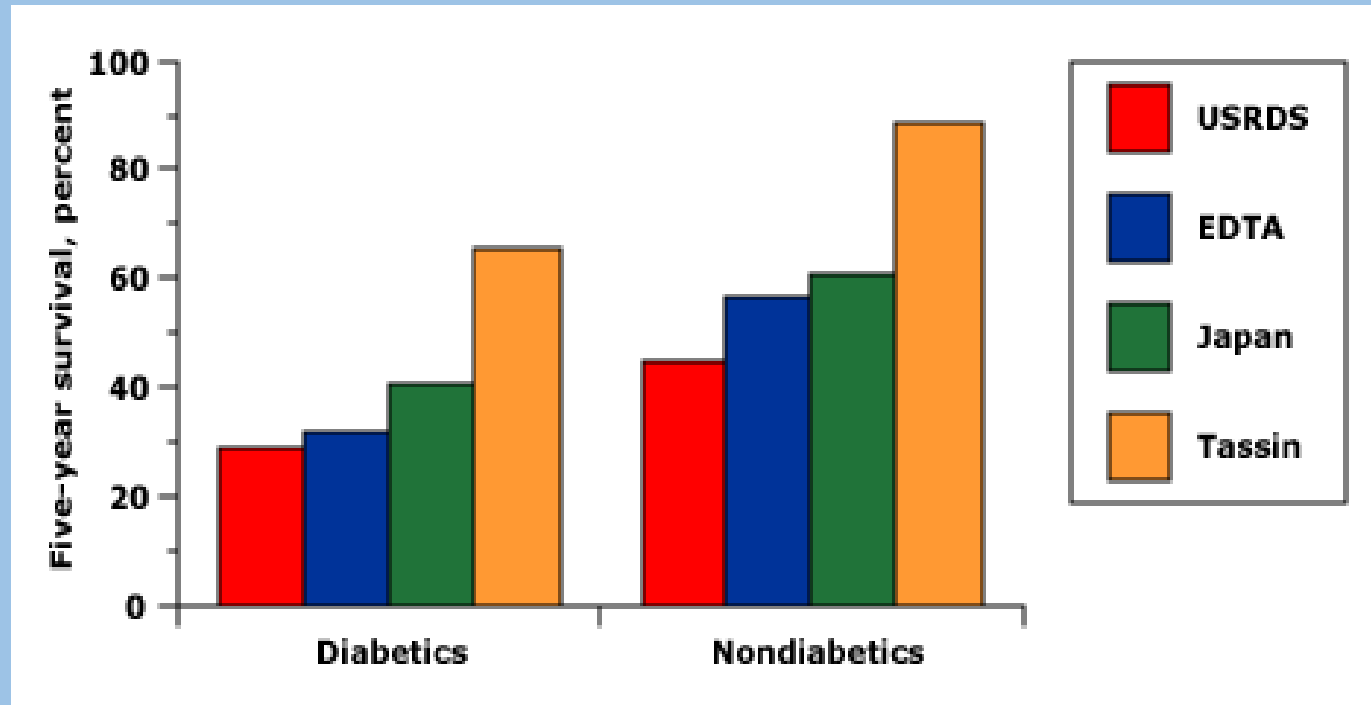
- 15-30% of hospitalizations
- Features
 - WBC >100, >50% neutrophils
 - Organisms on gram stain or culture
 - Abd pain
- Majority gram positive – touch contamination
- Gram negative – Touch contamination or bowel translocation
- Fungi

PD COMPLICATIONS

- Catheter malfunction
- Leaks

- Catheter tunnel infection

Mortality in ESRD



Mortality in ESRD

- Causes

- Cardiovascular diseases 50%
- Infection 15-20%

- Modality

- Home hemodialysis has mortality equivalent to transplant
- PD preserves residual kidney function and patients randomized to start PD and then transition later to HD have lower mortality than patients who start HD