BSPD Con 2025

2nd International Conference of BSPD

Let's Enjoy more Freedom with Home Dialysis

1st & 2nd December, 2025

Samson H. Chowdhury Centre, Dhaka Club, Shahbag, Dhaka-1000

"PD for Everyone Everywhere"

Organized by

Bangladesh Society for Peritoneal Dialysis

A Newsletter on Continous Ambulatory Peritoneal Dialysis (CAPD)

December, 2025



BSPD Con 2025

2nd International Conference of BSPD

Let's Enjoy more Freedom with Home Dialysis

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Convenor
Bangladesh Society for
Peritoneal Dialysis (BSPD)

FROM THE DESK OF CONVENOR

It is my profound pleasure and honour to address the nephrology community of Bangladesh on the occasion of the Second International Symposium of the Bangladesh Society for Peritoneal Dialysis (BSPD). Since its founding, BSPD has carried the vision of strengthening peritoneal dialysis (PD) across the nation—through education, collaboration, and a shared commitment to ensuring that every patient has access to safe and effective renal replacement therapy. Our progress has always depended on the guidance of senior nephrologists, the steady dedication of clinicians across the country, and the energy and ambition of our younger colleagues who represent the future of this field.

The burden of end-stage kidney disease (ESKD) in Bangladesh continues to rise. Hemodialysis (HD), while essential, is heavily centred in major cities and depends on infrastructure that remains out of reach for large segments of our population. For many families from rural and remote regions, the cost, travel, and physical strain required to access HD are overwhelming. In this setting, Continuous Ambulatory Peritoneal Dialysis (CAPD) is not simply an alternative; it is a lifeline—simple, home-based, gentle on hemodynamically unstable patients, and life-saving for neonates, children, and elderly individuals. In acute settings, PD has outcomes comparable to expensive CRRT, offering an affordable and effective option.

Yet PD in Bangladesh remains severely underutilised. The reasons are multifaceted: physician hesitation, limited training opportunities, a shortage of PD-trained nurses, high cost of PD fluid, and supply chain inconsistencies. Patient-level barriers also play a major role— fear of peritonitis, misconceptions about home dialysis, concerns about hygiene, and lack of confidence in performing exchanges independently.

These barriers are real, but none are unconquerable. At the patient level, we must provide clear, compassionate counselling; structured hands-on PD training; and follow-up support including home visits and tele-health-support where feasible. At the clinician level, expanding catheter insertion training, building PD-focused nursing programs, and offering regular workshops can strengthen confidence and skill. At the system level, reducing the cost of PD fluids through centralized procurement, supporting local manufacturing, ensuring uninterrupted supply, and integrating PD into national ESKD programs can create sustainable and equitable access. International experiences—from Hong Kong to Thailand—show that with coordinated policy, dependable supplies, and dedicated clinical leadership, PD can flourish. Our collaborations with the International Society for Peritoneal Dialysis (ISPD) and Bangladesh Renal Association continue to strengthen our capacity and provide invaluable guidance.

On behalf of BSPD, I extend my heartfelt thanks to all speakers, trainers, organizers, and contributors to this symposium. And to our younger nephrologists: the future of PD in Bangladesh will be built through your curiosity, leadership, and commitment. The challenges are real, but so are the opportunities. Together, we can create a dialysis system that reaches very patient, in every corner of our nation. Let us move forward together.

Prof. Dr. M. A. Samad



Member Secretary
Bangladesh Society for
Peritoneal Dialysis (BSPD)

FROM THE DESK OF MEMBER SECRETARY

There are about 850 million people around the world suffering from Chronic Kidney Disease (CKD). In Bangladesh, about 20 million patients suffer from CKD; of them 35-40 thousand develop end-stage kidney disease (ESKD) each year. HD is the most demanding renal replacement therapy. HD saves lives, but cannot be considered a planet friendly treatment. It contributes to global warming. It is one of the resource hungry medical interventions. A huge volume of water (about 500 L), significant amount of energy (over 7 KW) are used for a HD session. It has been calculated that one HD session produces 1.5 to 8 Kg of waste. Therefore, green nephrology and ecodialysis are very relevant issues. The ecological impact of peritoneal dialysis is obvious.

The prevalence of peritoneal dialysis (PD) continues to grow steadily worldwide. It is estimated that more than 272,000 patients worldwide are treated with PD, accounting for about 11% of the total global dialysis population. Peritoneal dialysis represents an internal technique for blood purification. In this modality of treatment, dialyzer, the membrane and dialysate compartment are provided by nature. Interest in peritoneal dialysis has been stimulated by the developments of coiled peritoneal catheters, APD equipment, different types of dextrose and non-dextrose based PD fluids, manipulations of solute and fluid transport, decreases in peritonitis rates with new connection approaches, better management of PD peritonitis and better experience of post-PD renal transplantation.

New advances in our understanding of the physiology of peritoneal dialysis (including the role of peritoneal lymphatics) and peritoneal dialysis kinetics are examples of the dynamic nature of the field.

Dr. Md. Rezaul Alam (Nippon)

BANGLADESH SOCIETY FOR PERITONEAL DIALYSIS

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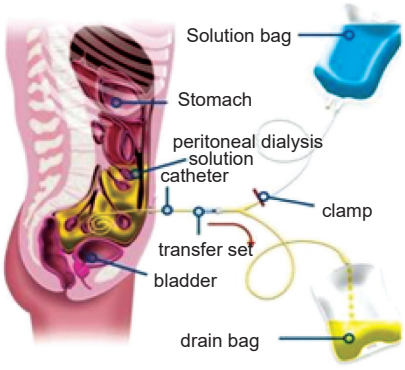
CHAPTER 01

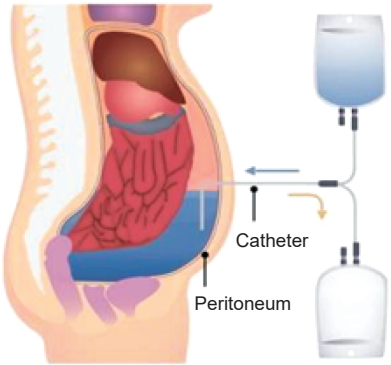
Train the Nephrology Trainees: Empowering the Future Nephrologists

STATION 01

WHY I CHOOSE PD

PERITONEAL DIALYSIS





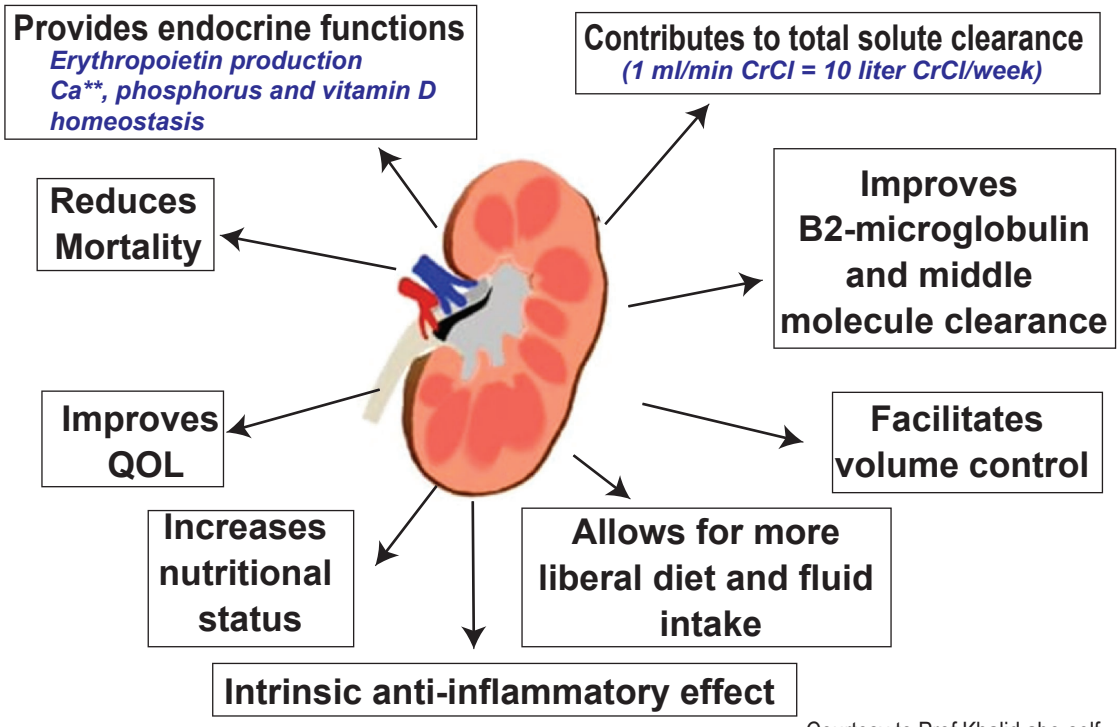


HEMODIALYSIS		PERITONEAL DIALYSIS
INTRAVENOUS (Cannula / AV Fistula) 	ROUTE	Indwelling Peritoneal Catheter. 
• Requires Sophisticated Hemodialysis Machine. • Usually done at Hospital.	ACCESSIBILITY	• Does Not require any Sophisticated Machine. • Can be done at Home.

Hydrostatic pressure	ULTRAFILTRATION	Osmotic Pressure via Dextrose Dialysate
• Requires special Biocompatible filters, M/C made up of Methy Cellulose Polymer	FILTRATION MEMBRANE	• Peritoneum acts as Filter
HIGH	COST	LOW
• Risk of Transmission of HIV, Hep B, Hep C, CMV. • Hence regular screening is needed.	• RISK OF INFECTION	<1% risk of Peritonitis.
• Cardiac disease in the major cause of death in dialysis patients. • Fluid and Electrolyte Shift are major causes of Sudden cardiac deaths • In Cardiomyopathy patients with EF <15% Hemodialysis is contraindicated.	ACUTE CARDIAC COMPLICATIONS.	Low Hemodynamic Shift. Hence safe in Cardiomyopathy also.
Risk of hypoglycemia.	EFFECT ON GLUCOSE LEVELS	Due to high Dextrose level in Dialysate fluid, there is risk of HYPERglycemia and Weight Gain.
Excellent Filtration Rate 800-1200 ml/hr	FILTRATION RATE	Poor Filtration Rate 15-25 ml/hr
Hemodynamic Instability. Cardiomyopathy with EF<15%	CONTRA INDICATIONS	• Excessive Peritoneal Adhesion • Third Trimester Pregnancy • Recent Abdominal Surgery

Benefits of Residual Renal Function

The huge advantage of even minimal residual renal function may be due to:



Courtesy to Prof Khalid abo-self

Barriers for PD

- Peritoneal scarring.
- Large abdominal hernia.
- Cognitive, psychosocial or physical impairment.
- Lack of appropriate environment at home (isolated clean area)
- Surgical ostomies (e.g. colostomy, ileostomy)
- Active cancer or inflammatory process (ESRD with sepsis, pancreatitis, appendicitis, cholecystitis, etc).
- VP Shunt

STATION 02

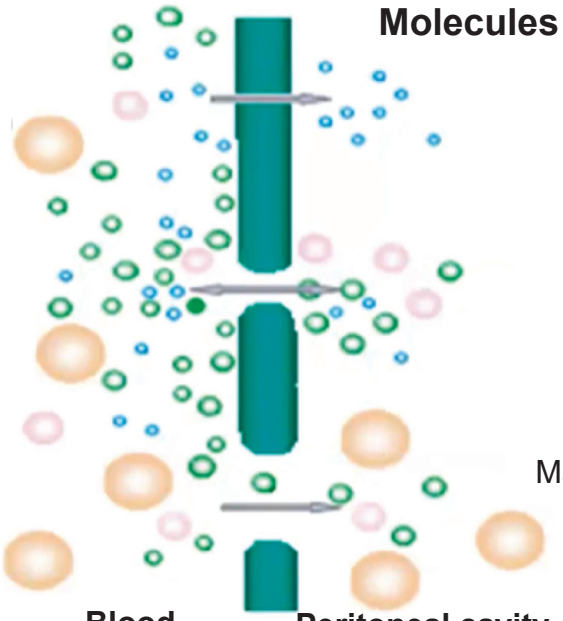
EDUCATION AND EXPENSE

Peritoneal membrane - basics

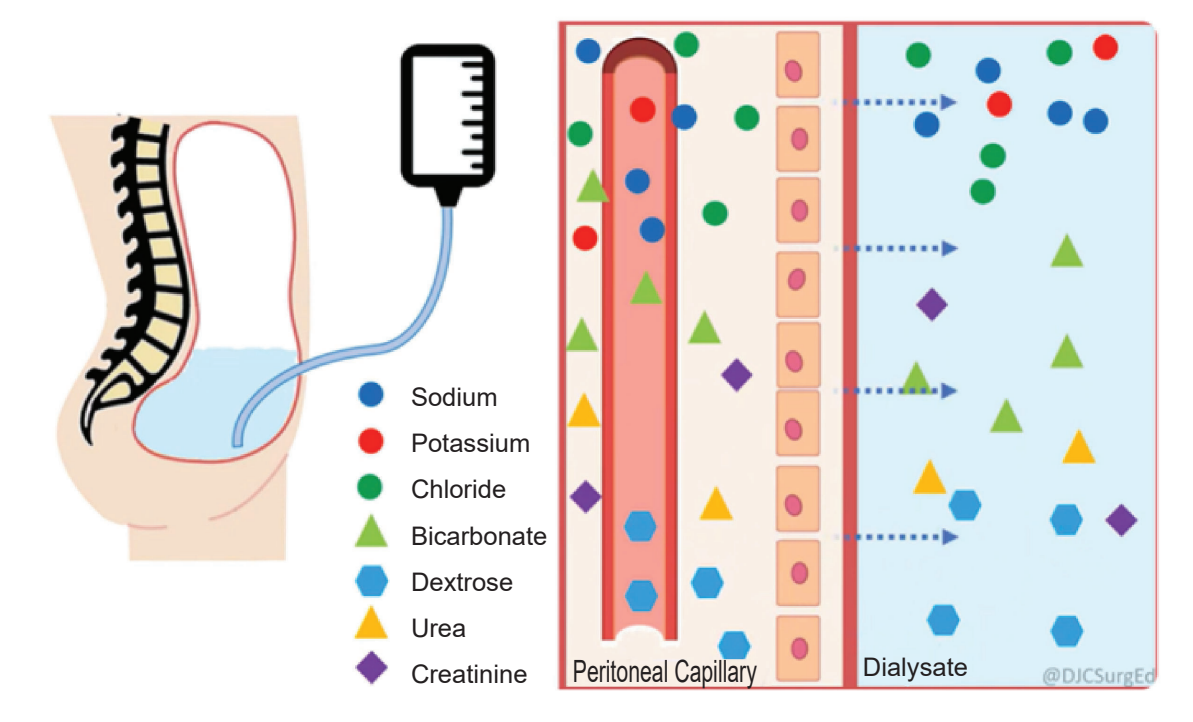
- A serosal membrane that covers peritoneal cavity.
- The parietal and visceral peritoneum.
- 20% is parietal and 80% is visceral.
- Lined by a mesothelial monolayer.
- Area equivalent to BSA i.e. 1 to 2 m^2.
- PD exhanges are made by parietal
- Peritoneum only.

3-Pore Model of Solute Transport

Type of Pore	Molecules Transported
Ultrasmall Pore (Transcellular Pore) Aquaporin I r = 3-5 A°	Water
Small Pore r = 40-60 A°	Urea Creatinine Glucose Water
Large Pore r > 200 A°	Proteins/ Macromolecules



50% of UF with dextrose comes through small pores and 50% via ultrapores.



What are the driving forces of PD?

Diffusion:

Example--tea bag in a cup of water.

- Transport across semi permeable membrane due to Concentration gradient
- Important variable:

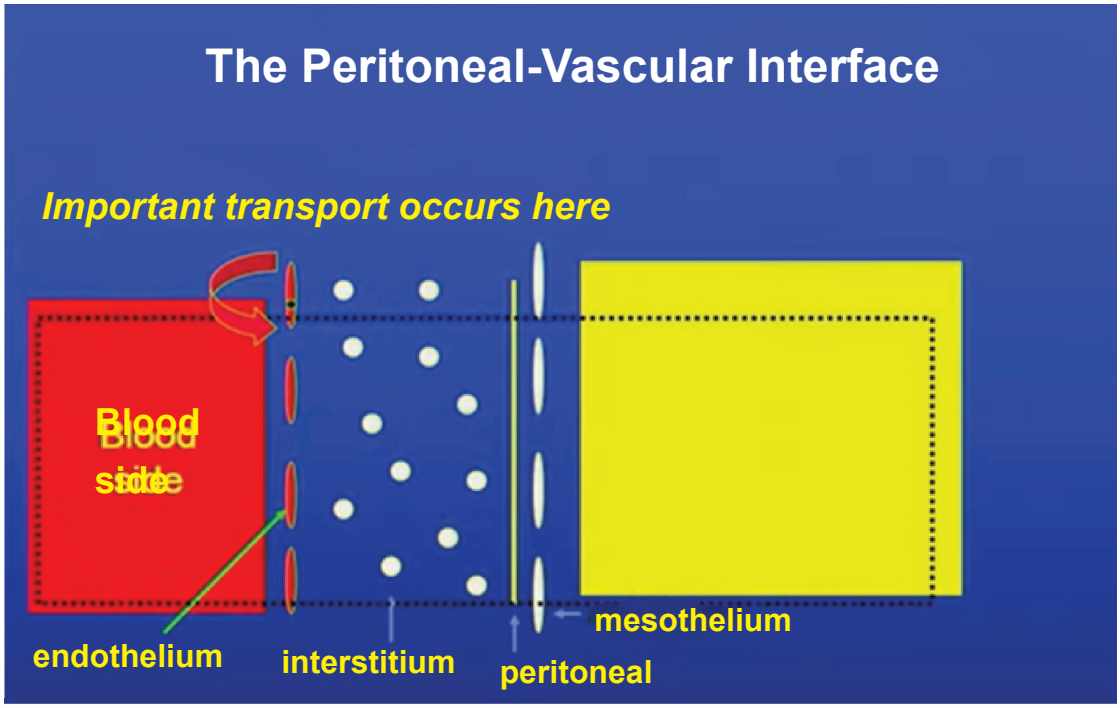
Solute concenteation gradient

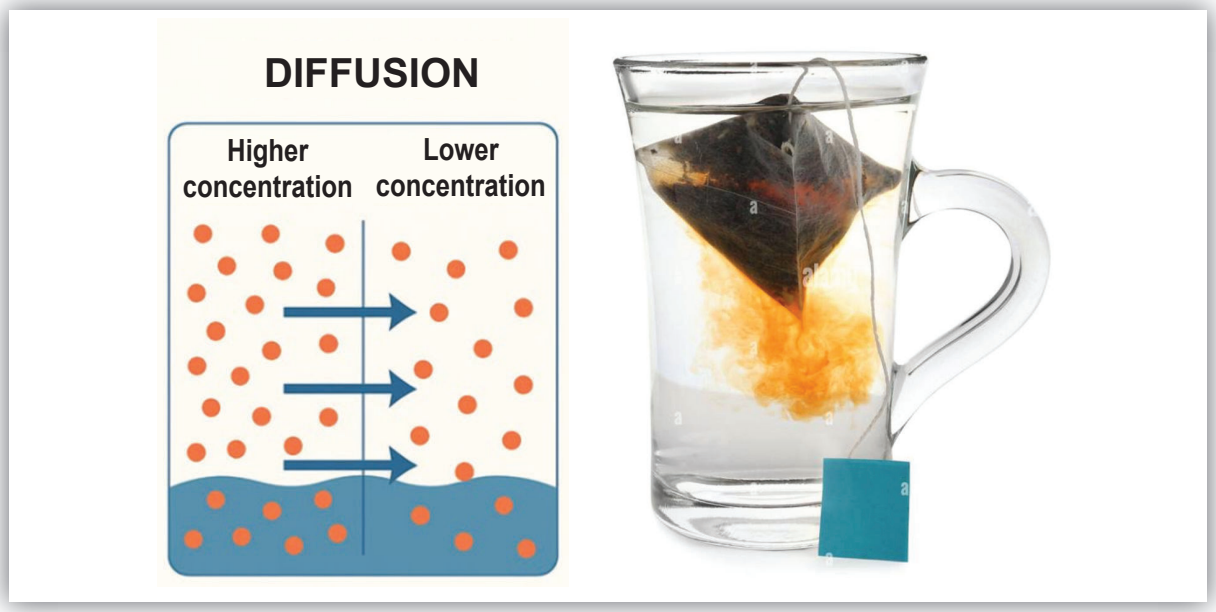
Surface area (double chambered tea bag).

Dwell time (keep the tea bag long time for good color.)

Blood flow rate (in low BP, low PD)

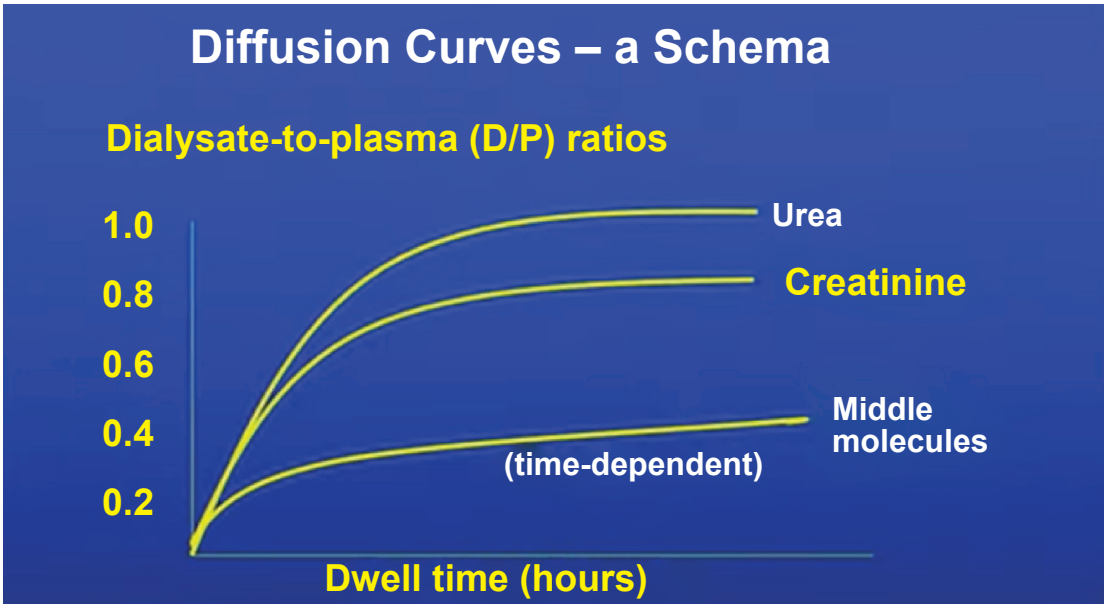
Dialysate flow rate (PD fluid leakage, low PD)





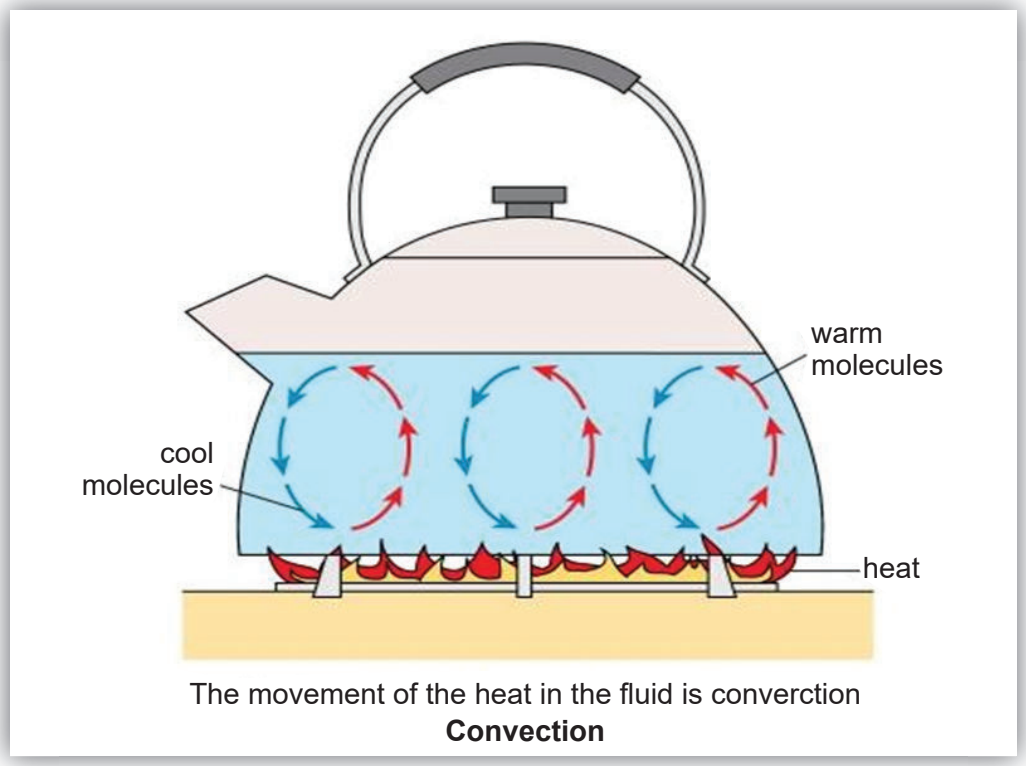
Diffusion Kinetics - from blood to dialysate

- diffusive flux is fastest in the first hour and slows over time
- by 4 hours, urea is > 90% equilibrated, creatinine > 60% equilibrated
- further small solute removal is minimal after that
- long dwells more important for removal of middle and larger MW solutes



Convection

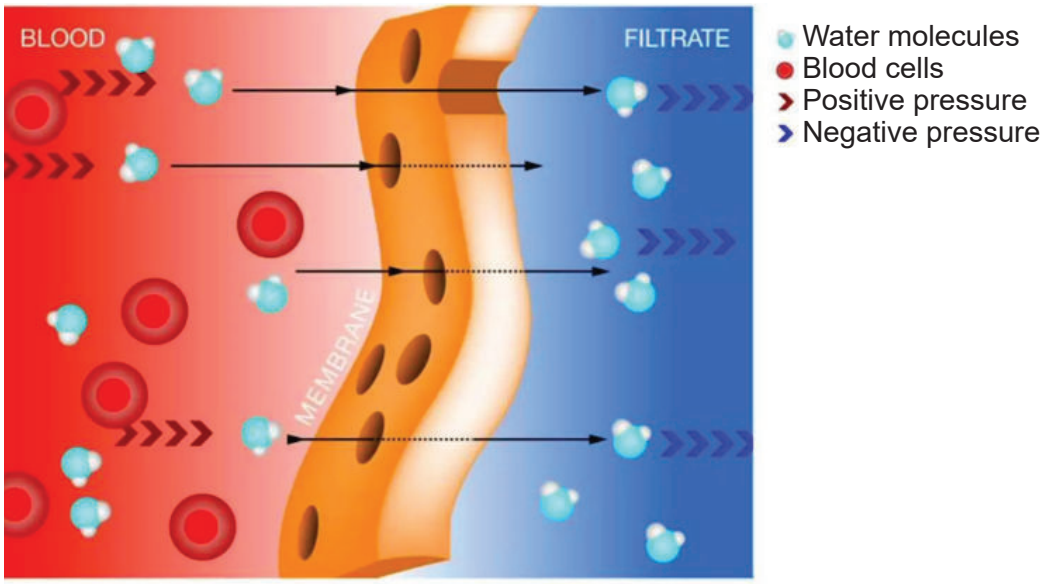
- Movement of water with dissolved solutes
- Depends on force:
- Osmotic force (pulling force), hydrostatic force (pushing force).



The movement of the heat in the fluid is converction

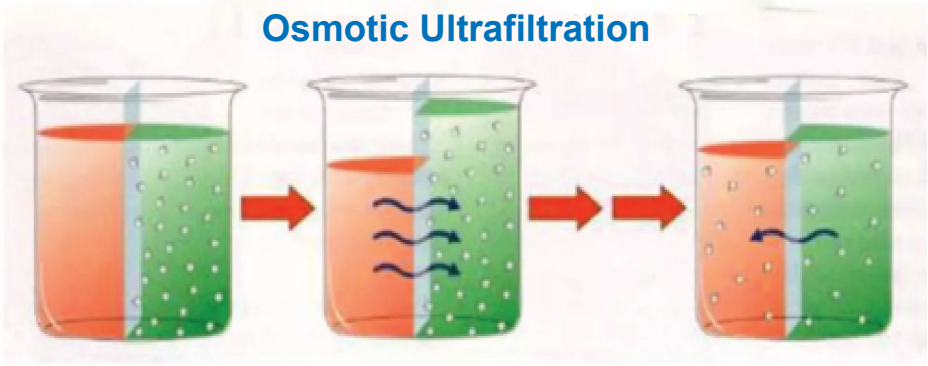
Convection

Ultrafiltration



Schematic diagram of Osmotic Ultrafiltration

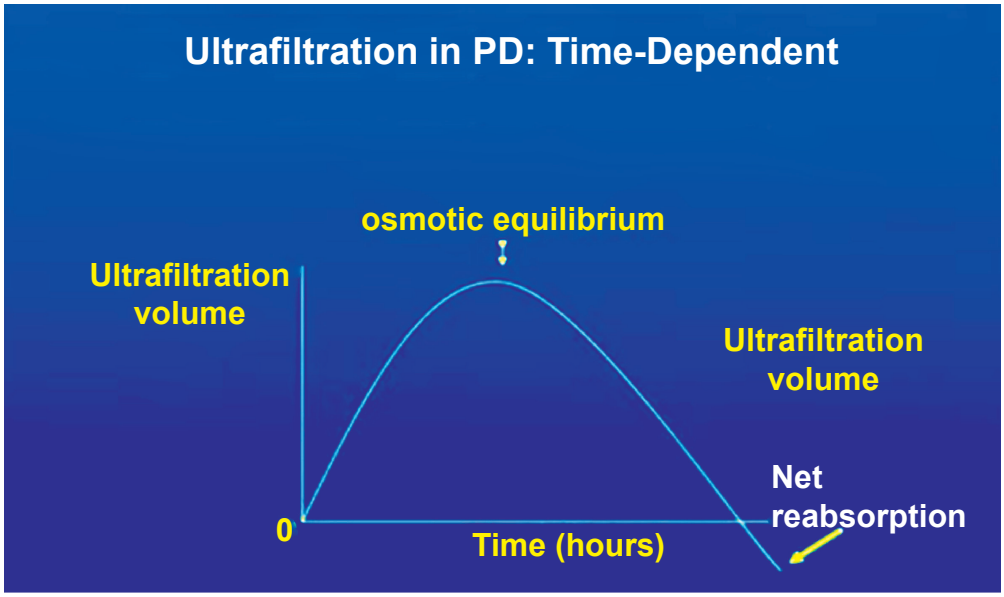
Peritoneal physiology



Glucose generates a high osmotic pressure which induces ultrafiltration from the capilaries (blood) to the peritoneal cavity

Ultrafiltration in PD

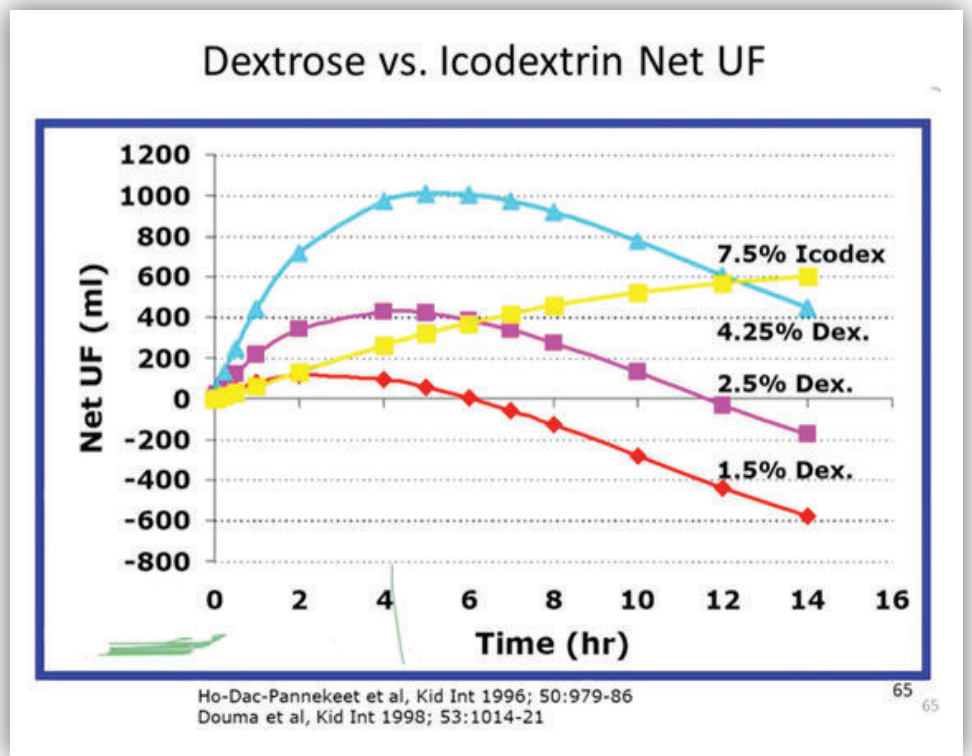
- produced by osmotic pressure (compared to HD where produced by hydraulic pressure)
- results of ultrafiltration:
  - fluid removal
  - convective removal of solutes, especially middle molecules



PD solutions

- 2 Broad catagories
- 1.5%, 2.5%, 4.25%
- Icodectrin
- Dextrose based :
- Non Detrosed based:
- Amino Acid based

Dextrose (g/dL)	1.5, 2.5, 4.25
Na (mEq/L)	132
Chloride (mEq/L)	96-102
Calcium (mEq/L)	3.5, 2.5
Magnesium (mEq/L)	0.5-1.5
L-Lactate (mEq/L)	35, 40
Osmolality (mOsm/kg)	346-485
pH	5.2



Economics of different modalities of PD

Traits	Full dose PD	Incremental PD	HD
Dialysis per week	7 days, 3 exchanges/day	5 days per week, 3 exchanges/day	2 to 3 sessions per week
Hours per session	8 hours per session	6 to 8 hours per session	4 hours per session
Monthly expenditure	3 sessions X 7 days X 4 weeks X 650 taka = 54600 taka	6 to 8 hours per session	4 hours per session
Monthly expenditure	3 sessions X 7 days X 4 weeks X 650 taka = 54600 taka	3 exchanges X 5 days X 4 weeks X 650 taka 39000 taka	2 to 3 sessions X 3300 X 4 weeks = 26400 to 39600 taka. Plus transport cost 4000 to 6000 taka. Grand total 30000 to 45000 taka/month. Absence from office of the patient and attendents. Tx cost also covers more Epo, BT, HBV, HCV (if +ve), hospitalization after HD etc. HD in corporate hospital costs more.

STATION 03

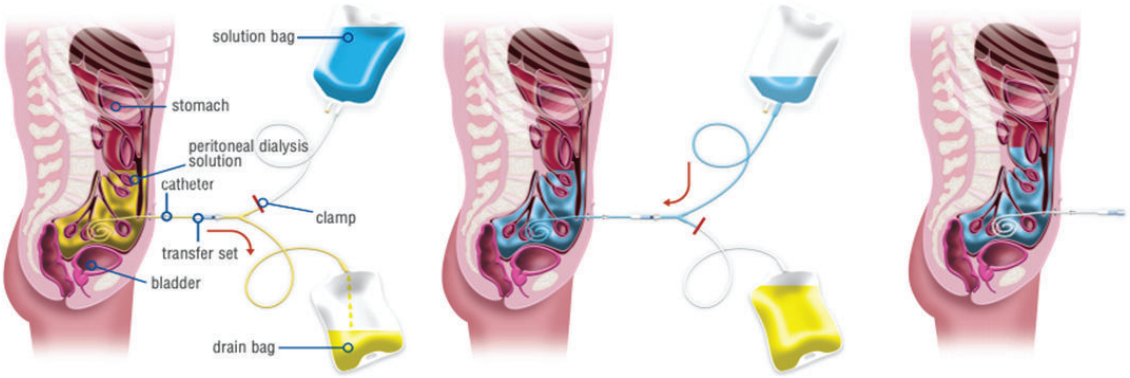
PD INSTRUMENTS & PD FLUID

HOW PD WORKS

1 DRAIN

2 FILL

3 DWELL



TYPES OF

PERITONEAL DIALYSIS

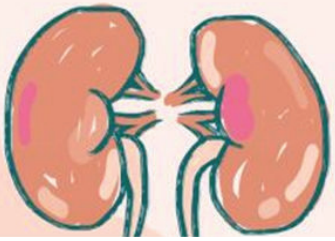
Peritoneal dialysis (PD) is a type of dialysis that uses the peritoneum in the abdomen as a natural filter to remove waste and excess fluid from the body. There are two main types of peritoneal dialysis:

Continuous Ambulatory Peritoneal Dialysis (CAPD):

- CAPD is the most common form of peritoneal dialysis. It does not require a machine and can be performed manually by the patient.
- In CAPD, a dialysis solution (dialysate) is introduced into the peritoneal cavity through a catheter. The dialysate remains in the abdomen for a period of time (dwell time) to absorb waste products and excess fluids.
- After the dwell time, the used dialysate is drained out of the abdomen and replaced with fresh dialysate. This process is repeated several times throughout the day.

Automated Peritoneal Dialysis (APD):

- APD uses a machine called a cycler to perform exchanges of dialysate automatically while the patient sleeps.
- The cycler is programmed to fill the abdomen with fresh dialysate, dwell for a specified time, and then drain the used dialysate out of the abdomen. This cycle is repeated several times during the night.
- APD offers more flexibility than CAPD as it does not require manual exchanges during the day, allowing patients to have more freedom during waking hours.







Regopotswe Malao-Chaane





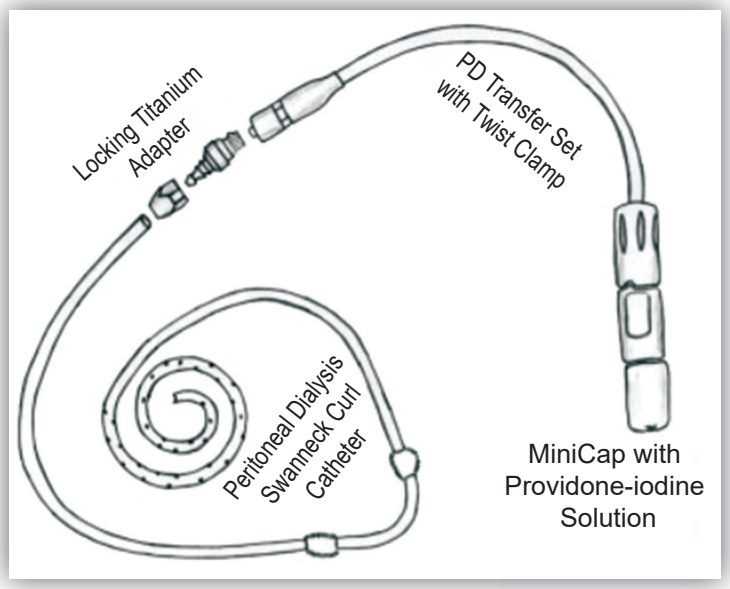


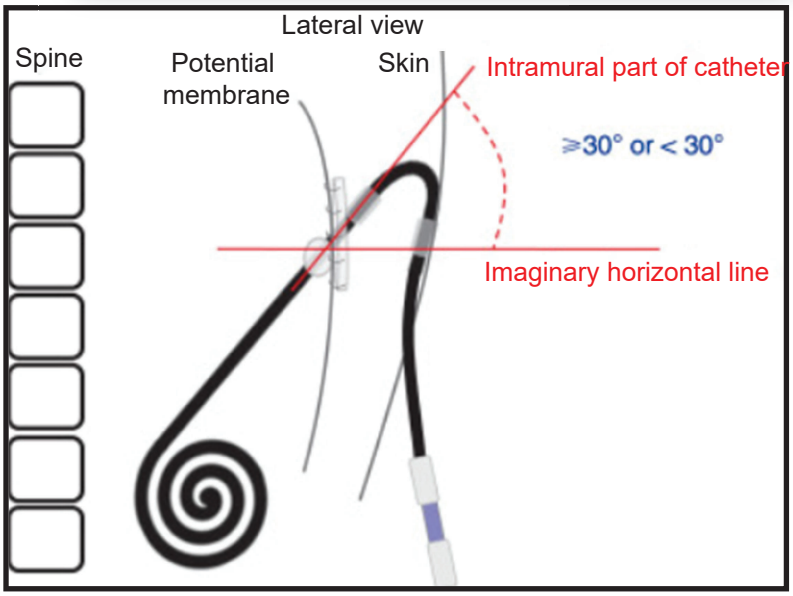
Standard tenckhoff catheter

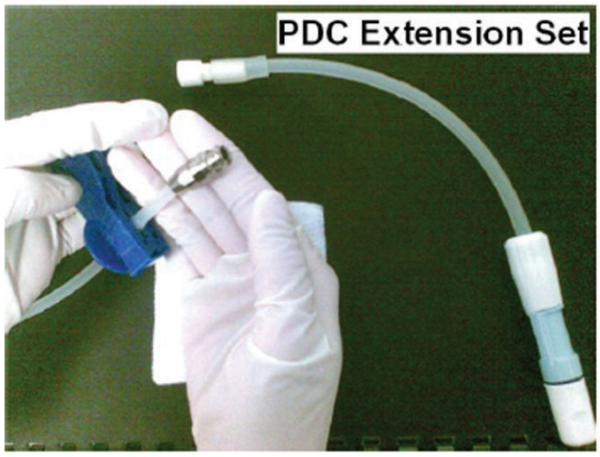
Swan-neck catheter

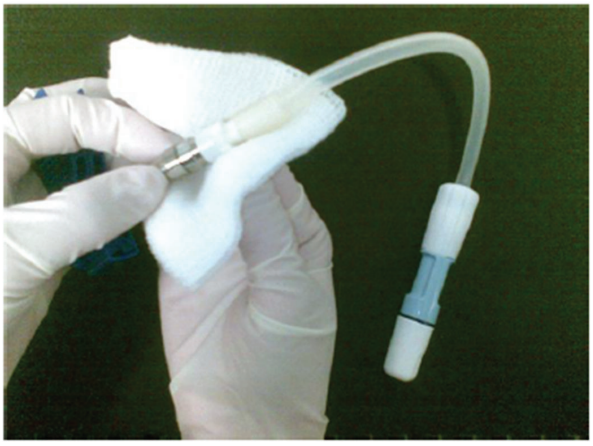


Coil catheter


Locking Titanium Adapter
PD Transfer Set with Twist Clamp
Peritoneal Dialysis Swanneck Curl Catheter
MiniCap with Providone-iodine Solution


Lateral view
Spine
Potential membrane
Skin
Intramural part of catheter
≥30° or < 30°
Imaginary horizontal line


PDC Extension Set

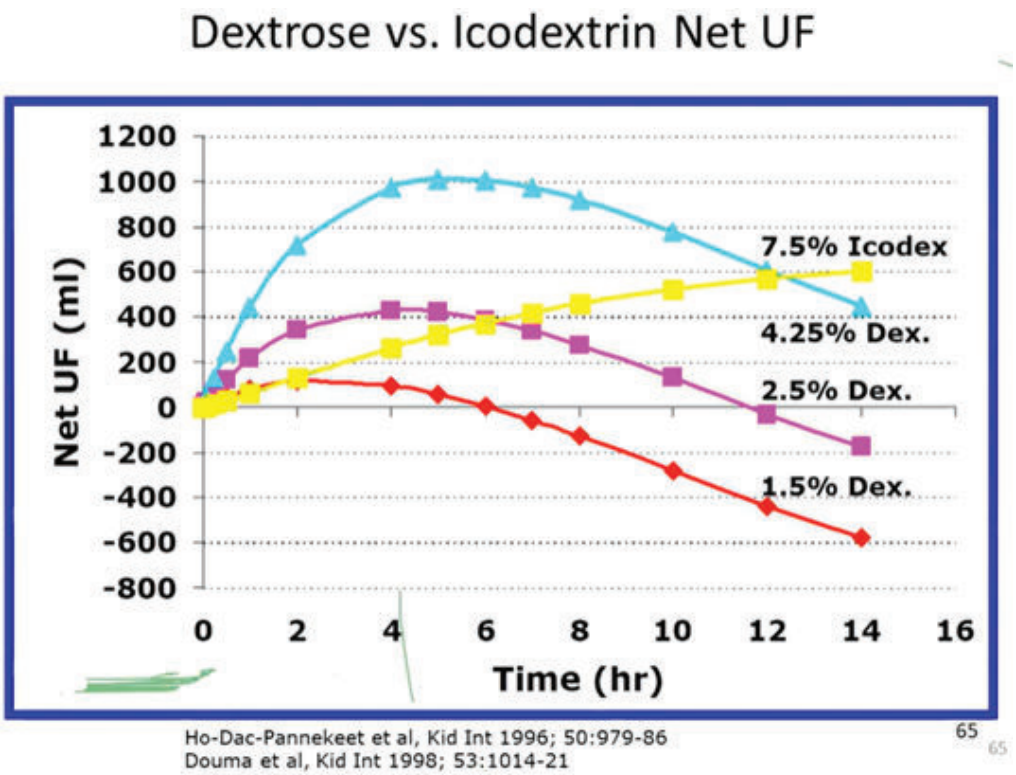


Simple Maths – helps to understand

- 1.5% dextrose meaning 1.5 grams in 100 ml = 1500 mg in 100ml = 1500 mg%
- 2.5% solution = 2500 mg%
- 4.25% solution = 4250 mg%
- Our blood glucose = 100mg%

Icodextrin

- Better UF. Keep in abdomen for 12 to 14 hours for best UF.
- Better improvement of volume overload.
- Better solutes clearance (convection).
- Better metabolic profile (no hyperglycemia)
- Better weight Mx.
- Better technique survival (less PM injury).

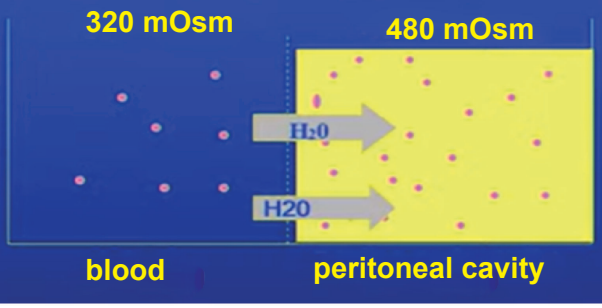


Ho-Dac-Pannekeet et al, Kid Int 1996; 50:979-86
Douma et al, Kid Int 1998; 53:1014-21

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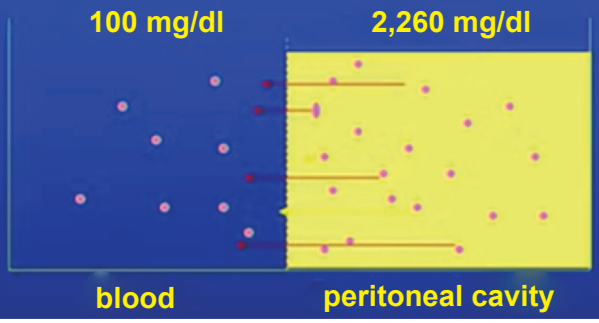
Ultrafiltration – Example of 4.25% Dialysate

Water will move from lower to higher osmolality



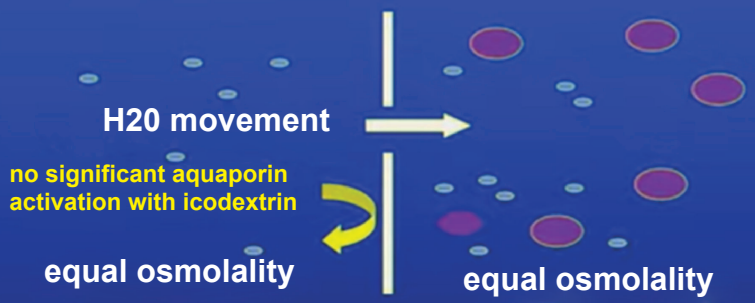
Ultrafiltration in PD

Glucose itself will diffuse out of peritoneal cavity along its own concentration gradient



Dextrose vs Icodextrin

Colloid osmosis with icodextrin



No Sodium Sieving with Icodextrin



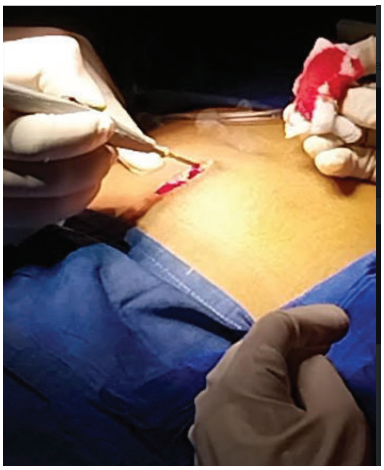
1 Liter of UF with dextrose

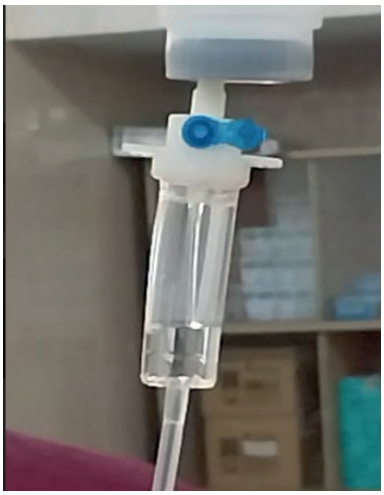
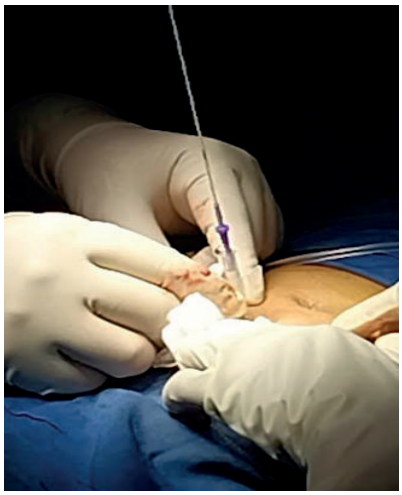
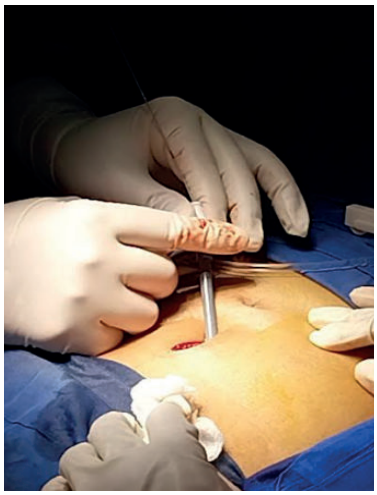
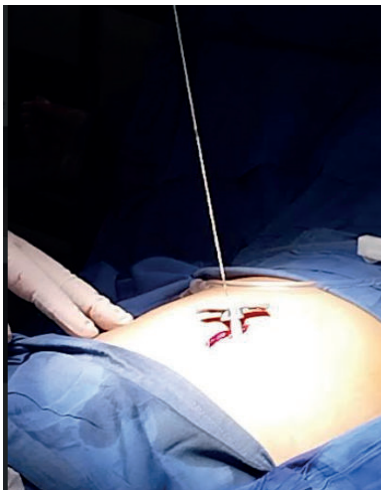
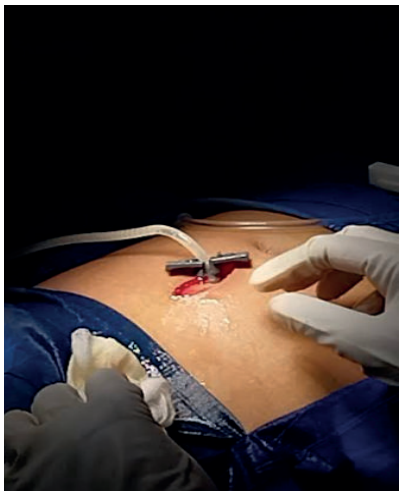
1 Liter of UF with icodextrin

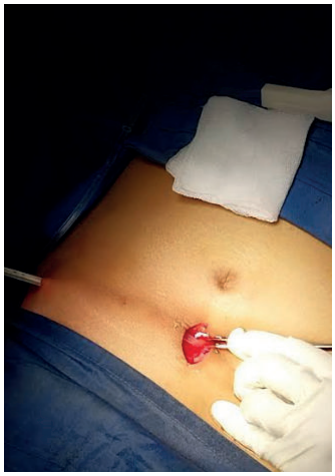


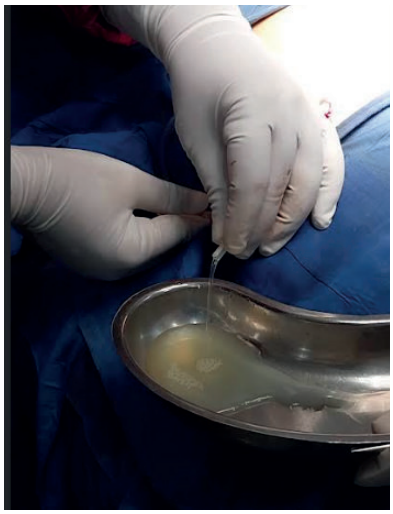
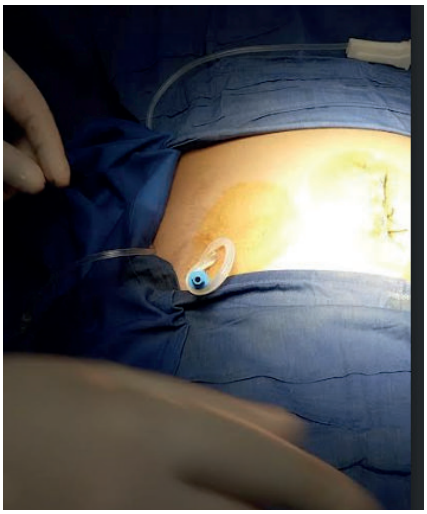
STATION 04

PD CATHETER INSERTION USING THE MODIFIED SELDINGER TECHNIQUE

1. Pre-procedure preparation

- Site marking: Mark the entry site (usually 2 cm below umbilicus) and the exit site (6 to 8 cm right lateral and caudal to the entry site).
- Sterilize the field of operation with povisep iodine solution from mid-chest to mid-thigh.
- Then cover the perioperative area with drapping sheets.
- Anesthesia: Administer local anesthesia in the midline below umbilicus.

2. Peritoneal access and guidewire placement.

- Incision and dissection: Make a 4 cm incision at the entry site and bluntly dissect the subcutaneous tissue down to the linea alba.
- Peritoneal puncture: Use a 16G or 18G IV cannula needle to puncture the peritoneum and access the abdominal cavity. The cavity is filled with 300 to 400 ml of free-flow normal saline to confirm placement.
- Guidewire insertion: Advance a flexible guidewire through the needle into the peritoneal cavity, then remove the needle, leaving the guidewire in place.

3. Tract dilation and sheath insertion

- Dilator insertion: Place a dilator over the guidewire and advance it to dilate the tract through the linea alba, extra-peritoneal fat and peritoneum.
- Peel-away sheath placement: Advance the dilator with peel-away sheath over it into the peritoneal cavity.
- Dilator and guidewire removal: Remove the dilator and the guidewire, leaving only the peel-away sheath in place.

4. Catheter insertion

- Catheter preparation: Make the coiled PD catheter straight with the stylet. Remove the air from the cuffs by compressing them under water.
- Catheter advancement: Insert the catheter through the sheath until the inner cuff is rested on the linea alba.
- Make sure the catheter in peritoneal cavity with free flow of fluid.

5. Tunneling and exit site creation

- Tunnel creation: Create a subcutaneous tunnel from the entry site to the planned exit site by the stylet.
- Cuff placement: Position the outer cuff subcutaneously within the tunnel, leaving at least 2 cm between the cuff and the exit site. Finally again check the catheter with free-flow of fluid.

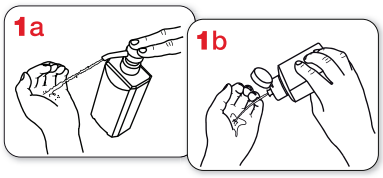
6. Post-procedure confirmation

- Functional check: Test the catheter's function by flushing with normal saline and confirming both inflow and outflow are adequate.
- Infuse 1 ml of heparin injection and 1 gram of vancomycin injection in the peritoneal cavity.
- Closure and dressing: Close the entry site with skin by suturing with 2-0 silk with cutting body needle. Never give stitch to the exit site. Apply sterile dressings to entry and exit wounds.
- Imaging: Perform an imaging study to verify the catheter's final position in lower pelvis same day or the next day.

STATION 05

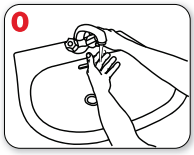
PD FLASH AND EXCHANGE

How to handrub?
WITH ALCOHOL-BASED FORMULATION

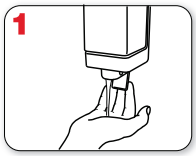


Apply a palmful of the product in a cupped hand and cover all surfaces.

How to handwash?
WITH SOAP AND WATER



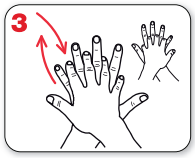
Wet hands with water



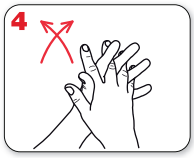
apply enough soap to cover all hand surfaces.



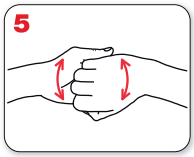
Rub hands palm to palm



right palm over left dorsum with interlaced fingers and vice versa



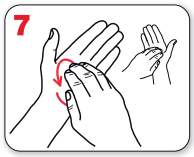
palm to palm with fingers interlaced



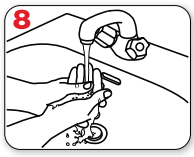
backs of fingers to opposing palms with fingers interlocked



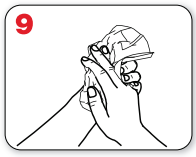
rotational rubbing of left thumb clasped in right palm and vice versa



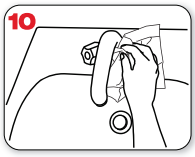
rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa



rinse hands with water

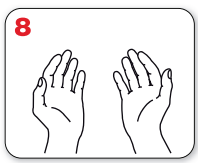


dry thoroughly with a single use towel



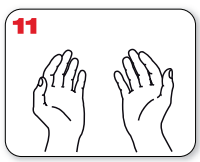
use towel to turn off faucet

20-30 sec



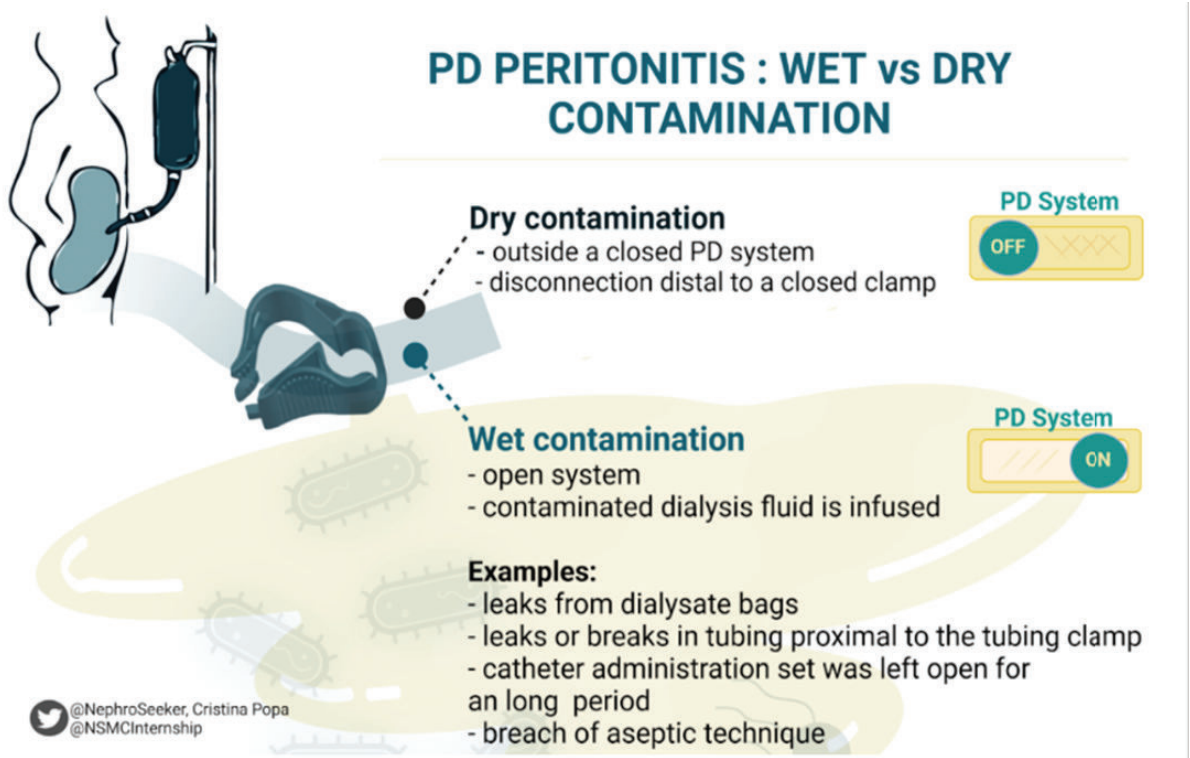
…once dry, your hands are safe.

40-60 sec



…and your hands are safe.

Design: mondofragilis network



Prophylactic antibiotics are only recommended for wet contamination. There is no standard regimen of antibiotics that is recommended for wet contamination.



How to clean exit site

Look at Exit Site



Wash



Apply cream and secure catheter



STATION 06

PD CATHETER INSERTION BY SURGICAL METHOD

OPEN SURGICAL TECHNIQUE OF TENCKH OF CATHETER IMPLANTATION

After proper cleaning and sterilization, under local anesthesia a left lower transverse incision 2 inches in length is made on the abdomen.

After blunt dissection of subcutaneous tissue anterior rectus sheath is exposed.

A transverse incision is made on the anterior rectus sheath and thereby the rectus abdominis muscle is exposed.

Then the muscle is split in the middle and thereby the posterior rectus sheath is exposed. Care to taken so that the inferior epigastric artery is not damaged.

In fact, the posterior rectus sheath remains attached with the parietal peritoneum. This sheath is held and pulled up with two straight mosquito forceps.

An incision is made and the peritoneum is opened. Care to be taken not to injure the omentum and small bowel.

Two more mosquito forceps is applied to hold the peritoneum upwards.

A purse-string suture is applied surrounding the whole using No 2/0 round bodied vicryl. The inner Dacron cuff remains out of the peritoneum.

Tenckh off catheter is introduced towards the pelvis using a rigid guide wire. Positioning the catheter in the pelvis guidewire is removed.

Inflow and outflow are assured.

The suture is tightened good enough to hold the catheter so that it does not come out spontaneously.

A double turn is also applied to ensure any further leakage of fluid from the abdomen.

Outer part of the catheter is taken out through a small puncture whole in the upper part of anterior rectus sheath.

Now the split rectus-abdominis is apposed with 3 or 4 sutures upwards from the entry point of the catheter so that the catheter gets an oblique position which will prevent the catheter tip migration from the pelvis.

Anterior rectus sheath is closed with the same vicryl.

Outer part of the catheter is pulled out through a stab incision at a site lower than the original incision so that the outer Dacron cuff remains approximately 1 inch above the exit point.

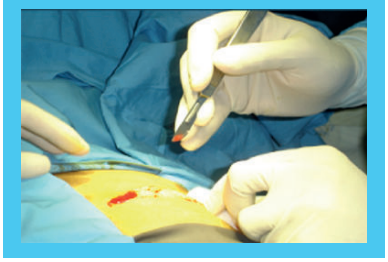
Abdomen is closed in layers. The whole procedure takes half an hour time. Titanium adapter and Connector is fixed.

Now the catheter is ready for immediate use with regular exchanges.

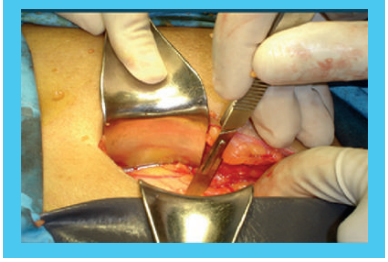
Advantages of open surgical technique:

- Can start regular exchange on the same day.
- Known as "urgent-start PD" (Avoids temporary hemodialysis via central venous catheter and its complications).
- No chances of peritonitis as bacteria do not get the time to colonize.
- No chances of catheter tip migration (catheter placed obliquely in the pelvis).
- Surgical enhancements (e.g. double purse-string suture at rectus sheath) reduce leakage risk.
- No chances that the catheter should come out spontaneously (re-enforced pursing suture is applied).

Incision



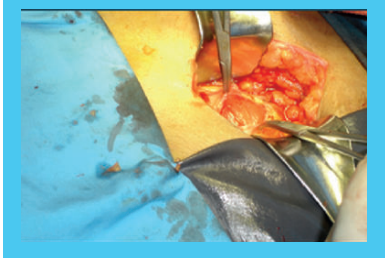
Anterior Rectus Sheath



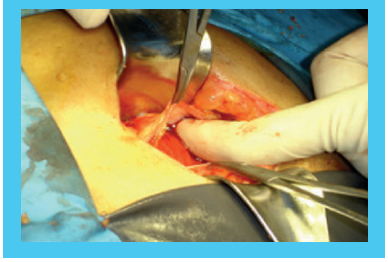
Cutting Anterior Rectus sheath



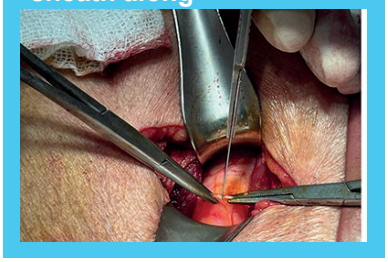
Rectus Abdominis Muscle



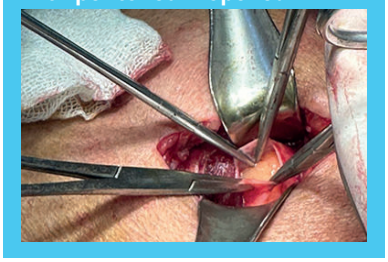
Splitting Muscle



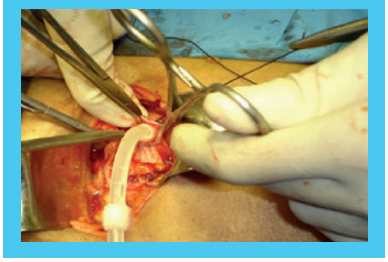
Cutting posterior rectus sheath along



Posterior rectus sheath along with peritoneum opened



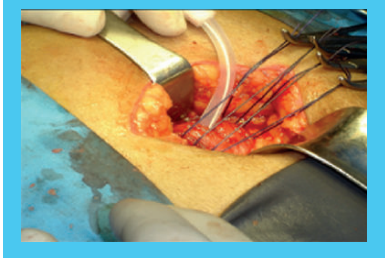
Tightening Pursing Suture



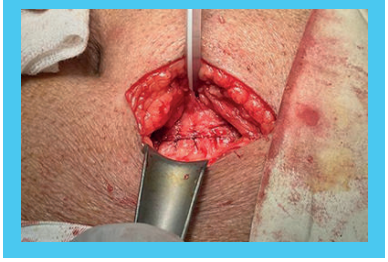
The double turn



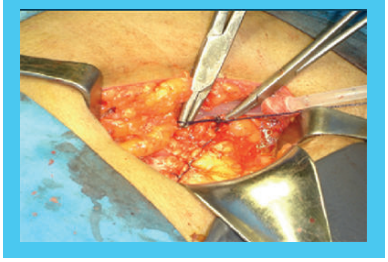
Fixing Cath Obliquely



Catheter Secured



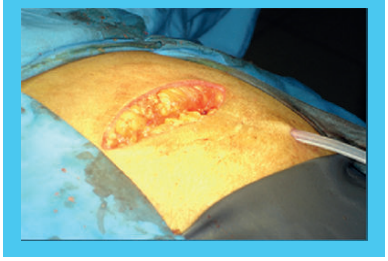
Anterior Rectus Sheath Closing



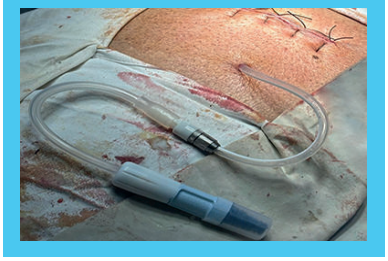
Making Exit Site



Exit Site Made



Ready For Use



STATION 07

INFECTIOUS COMPLICATIONS OF CAPD

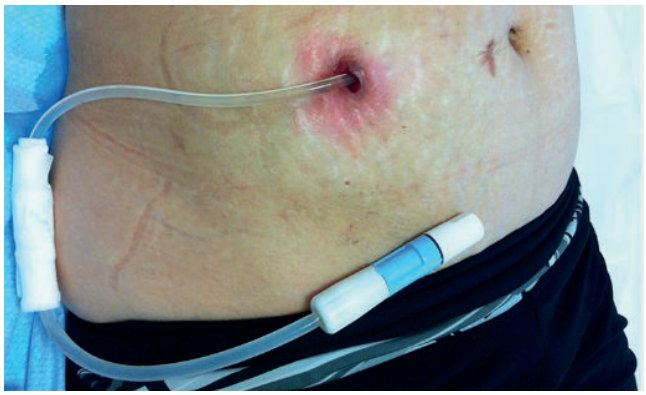


Figure: Exit site infection



Figure: Tunnel infection

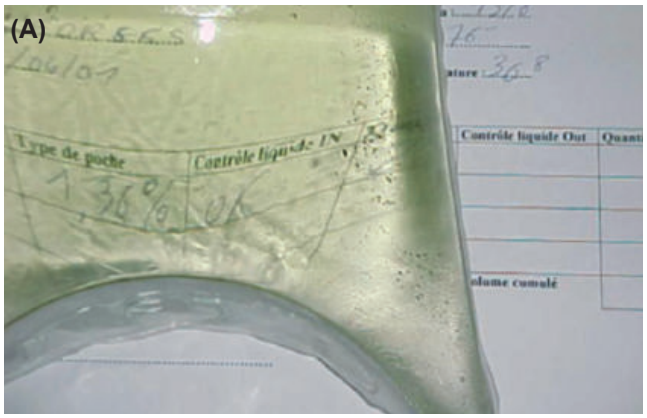


Figure: Clear effluent (Normal)

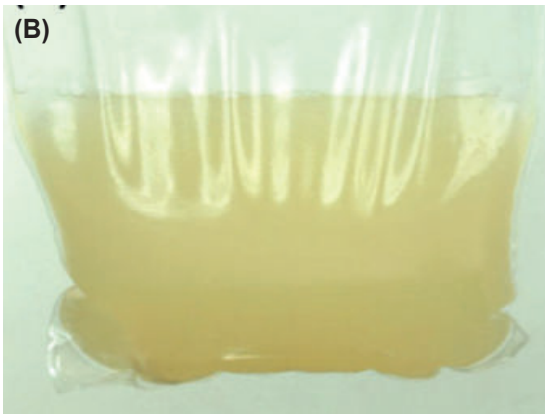


Figure: Cloudy effluent due to peritonitis

Diagnosis of peritonitis

Peritonitis should be diagnosed when at least two of the following are present: (1C)

- Clinical features consistent with peritonitis, that is, abdominal pain and/or cloudy dialysis effluent
- Dialysis effluent white cell count > 100/μL or > 0.1 X 109/L (after a dwell time of at least 2 h), with > 50% polymorphonuclear leukocytes.
- Positive dialysis effluent culture

Definition of culture negative peritonitis

- Clinical features consistent with peritonitis, that is, abdominal pain and/or cloudy dialysis effluent
- Dialysis effluent white cell count > 100/μL or > 0.1 X 10°/L (after a dwell time of at least 2 h), with > 50% polymorphonuclear leukocytes
- No organism is identified on culture of dialysis effluent.

Treatment of peritonitis : Initial and subsequent

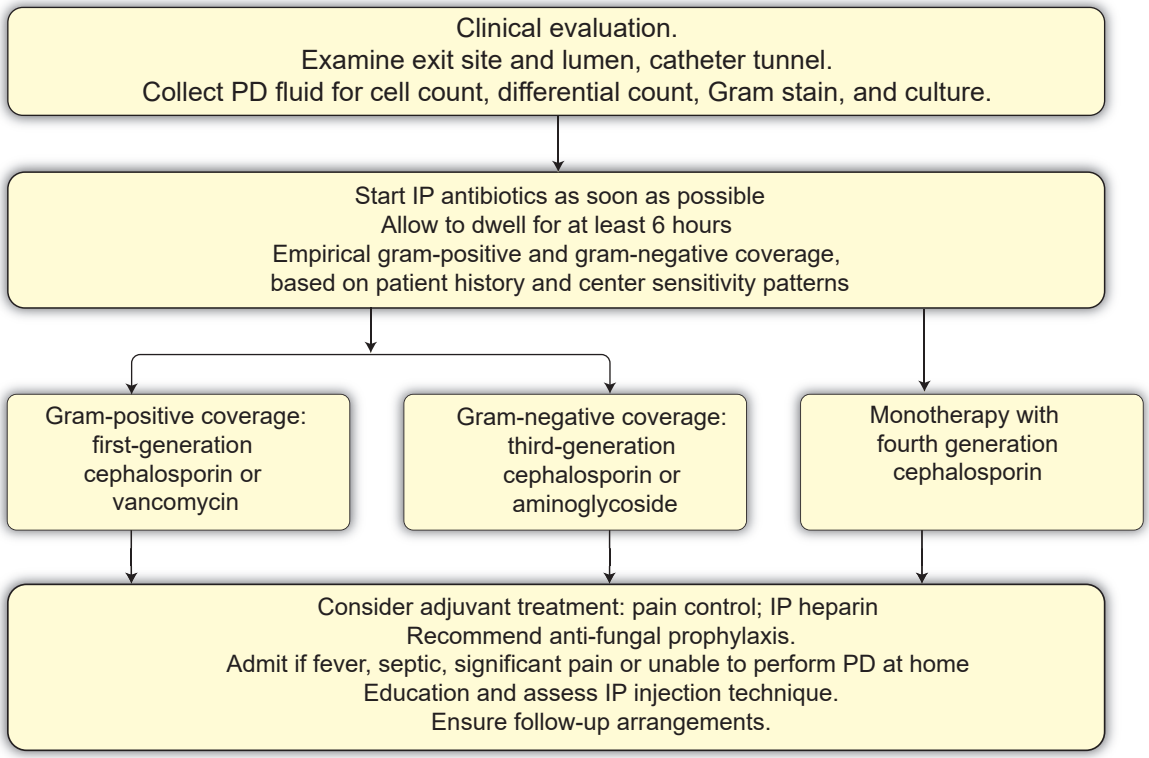


Figure 1 from ISPD 2022 Peritonitis Guideline

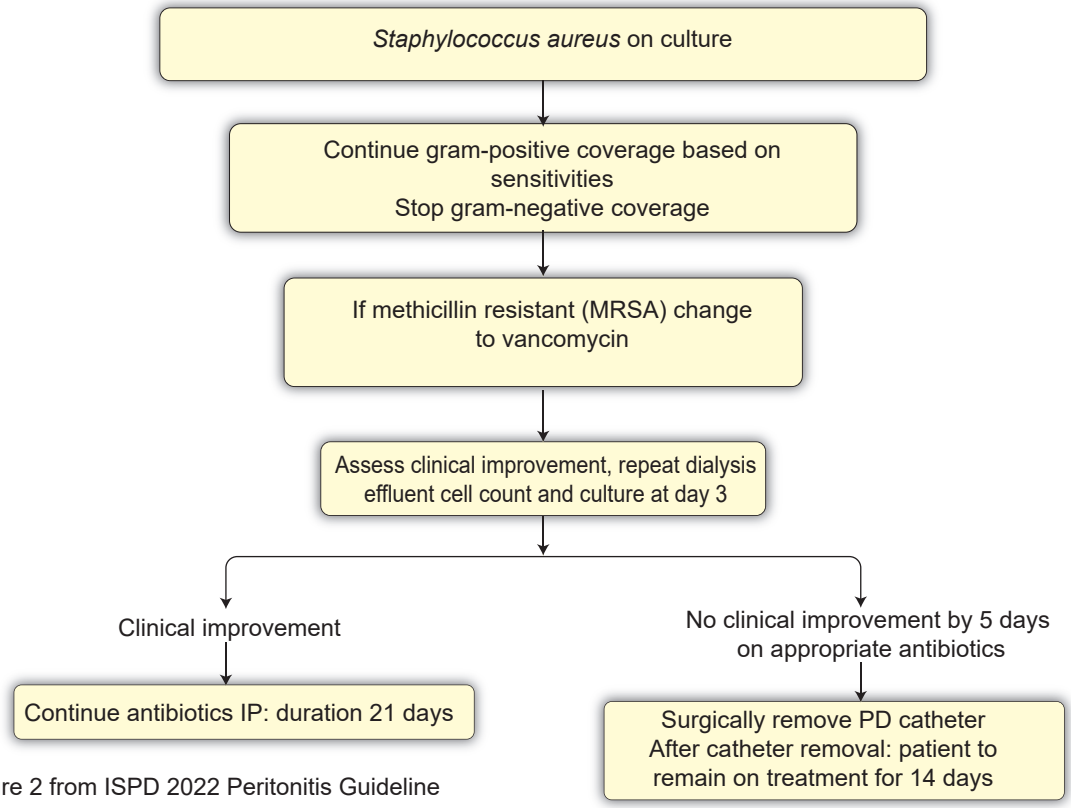


Figure 2 from ISPD 2022 Peritonitis Guideline

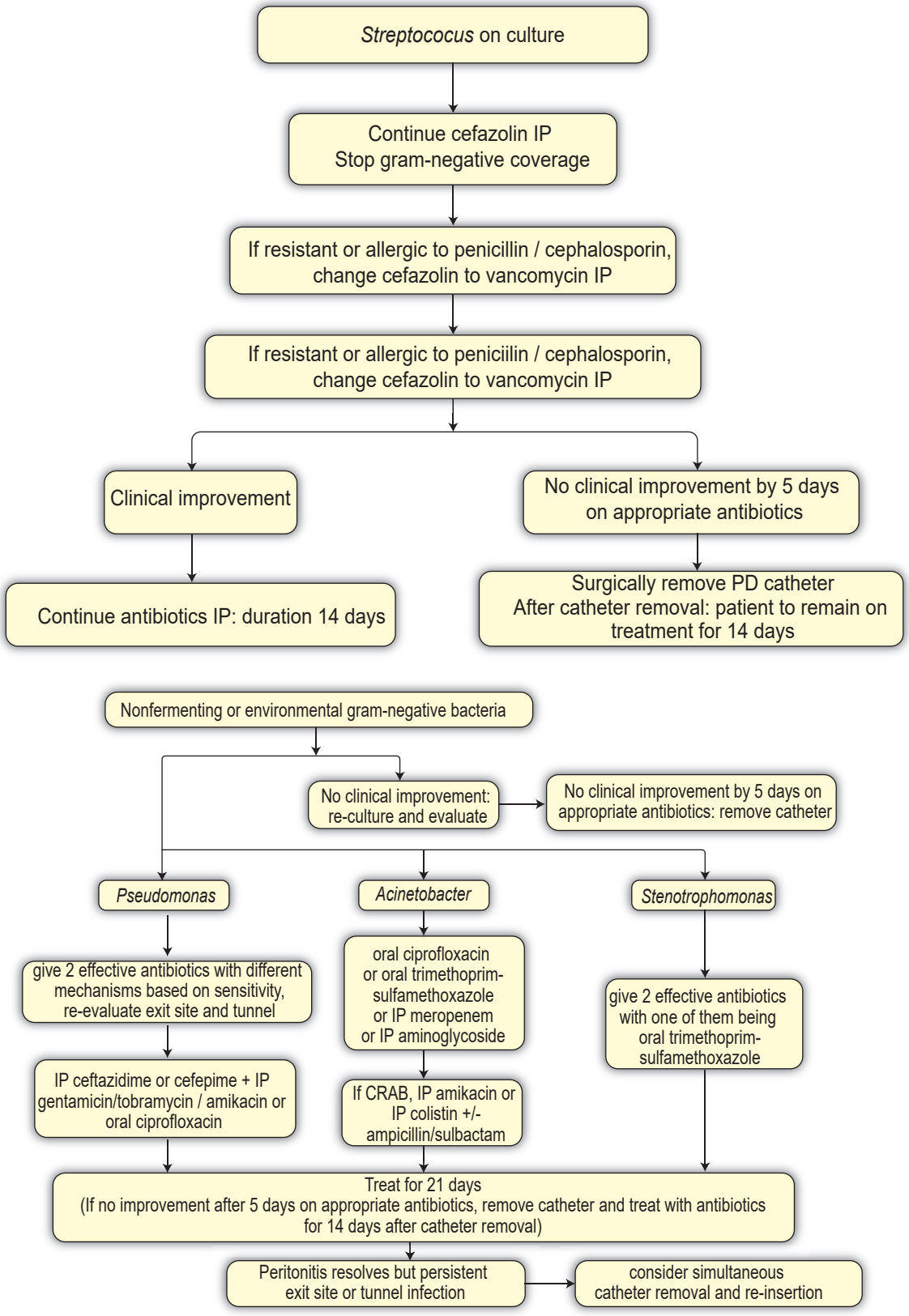


Figure 6 from ISPD 2022 Peritonitis Guideline

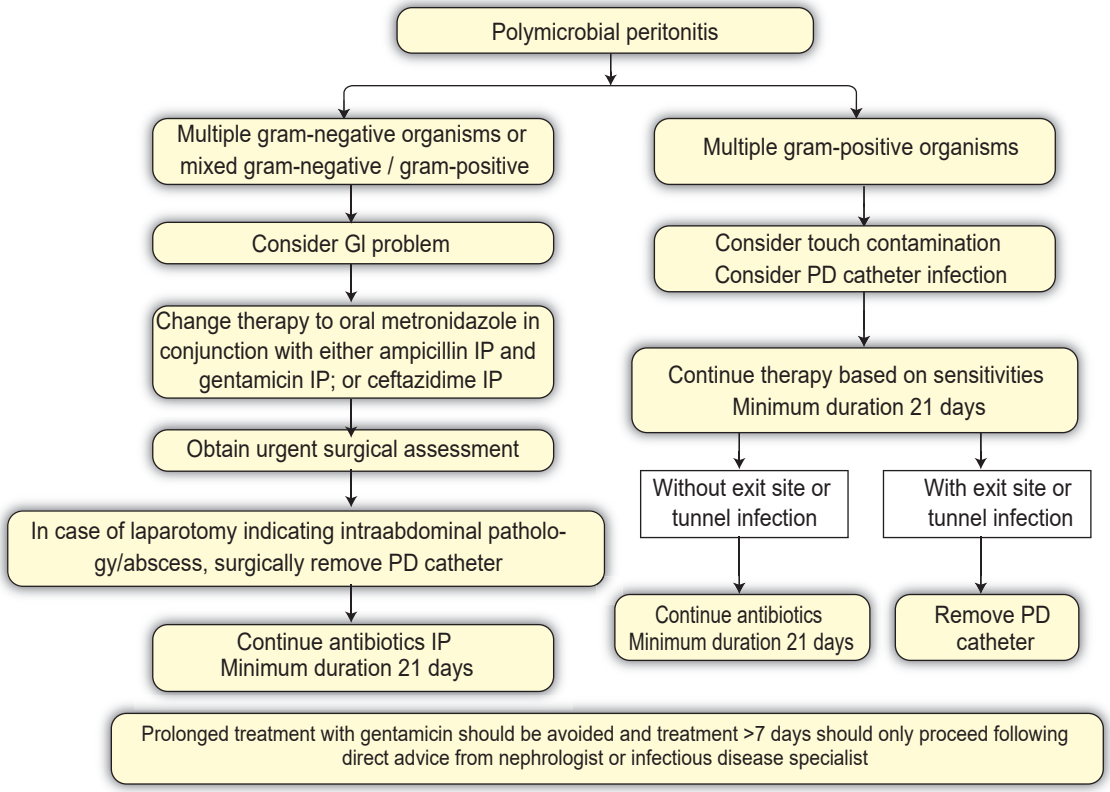


Figure 8 from ISPD 2022 Peritonitis Guideline

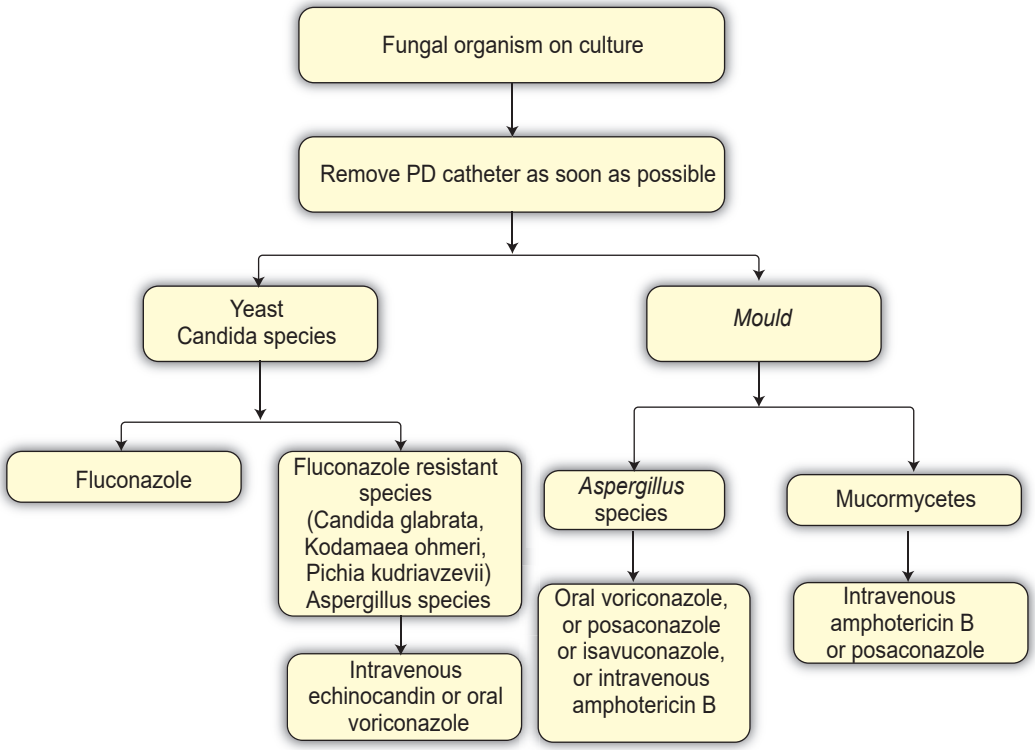
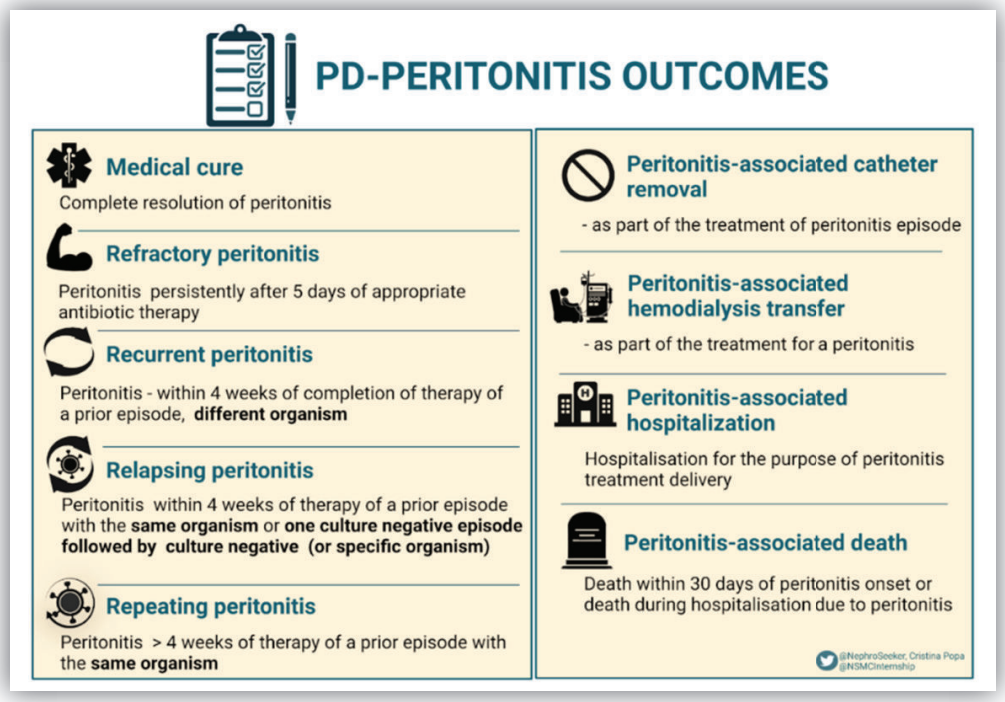
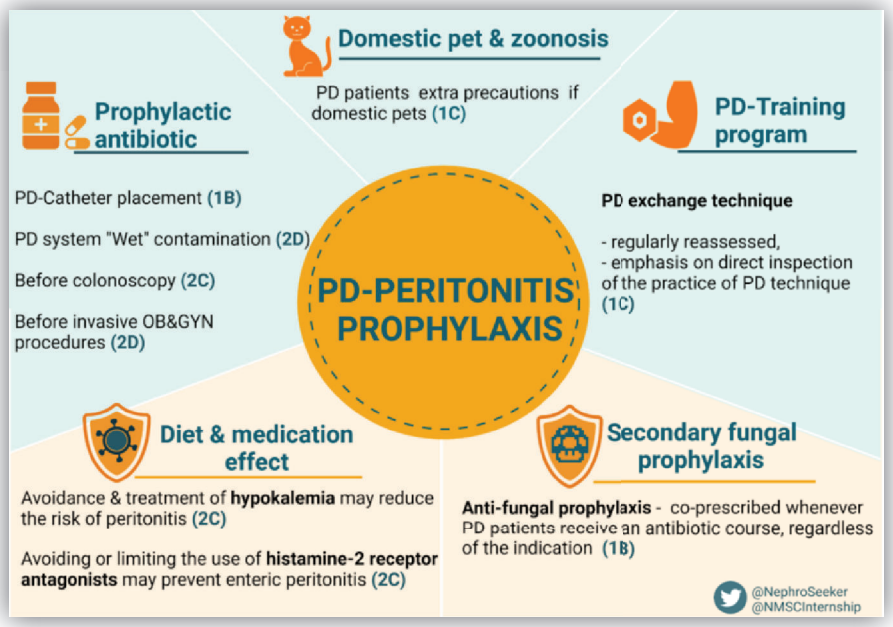


Figure 9 from ISPD 2022 Peritonitis Guideline



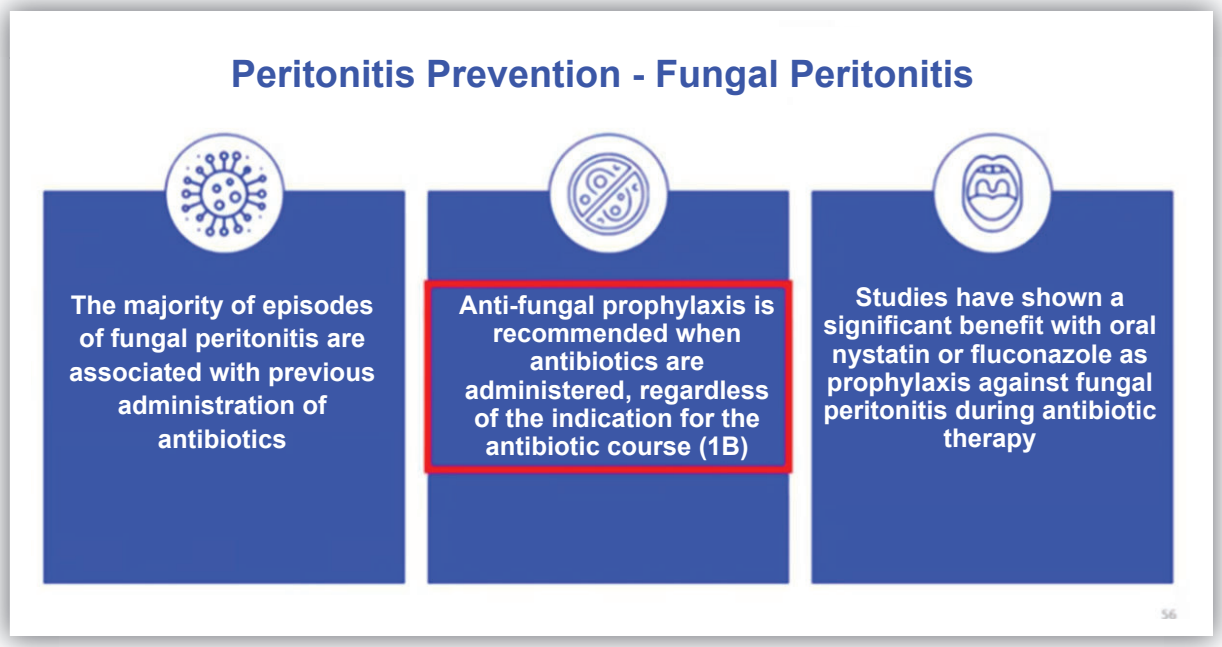
Refractory peritonitis

- PD catheter be removed in refractory peritonitis episodes, defined as failure of the PD effluent to clear after 5 days of appropriate antibiotics (1D).
- Observation for antibiotic effect longer than 5 days is appropriate if PD effluent white cell count is decreasing towards normal, instead of mandatory PD catheter removal if effluent does not clear up by day 5 (2C)



Fungal peritonitis

- Immediate catheter removal when fungi are identified in PD effluent (1C)
- Treatment with an appropriate anti- fungal agent be continued for at least 2 wks after catheter removal (2C) & sometimes up to 4 wks
- Treatment failure & mortality rates of fungal peritonitis remain high (50-91%)
- Slightly improved outcome (2-3 times less) with early catheter removal
- Prompt empirical treatment with antifungal therapy should be initiated even based on the Gram stain
- Resumption of PD reported after a median period of 15 wks in less than one-third of cases.



Indications for catheter removal

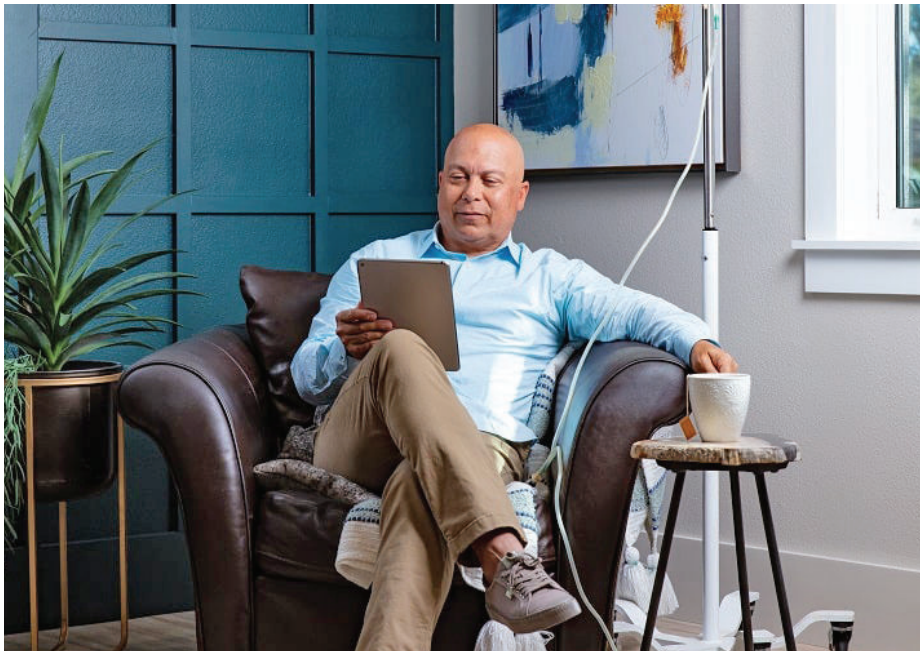
- Failure of PD fluid to clear after 5 days of appropriate therapy (Refractory)
- Infection within 4 weeks of completion of therapy with the same organism (Relapsing)
- Associated tunnel and exit site infections
- Fungal peritonitis
- Multi-enteric organisms

STATION 08

COFFEE AND COOKIES









STATION 09

NON INFECTIOUS COMPLICATIONS OF CAPD

Causes of reduced ultrafiltration

- Noncompliance
- Excess salt and water intake
- Incorrect choice of dialysate tonicity
- Loss of urine output
- Mechanical causes (Catheter migration, catheter blockage, leakage into pleural cavity, genital, abdominal wall)
- Hyperglycemia
- Ultrafiltration failure

Definition of UF Failure

- Increasing requirement for high osmolarity dialysate (3 or more 4.25% glucose solution exchanges daily) to maintain edema free target weight.
- Defined as net UF < 400ml/4h (using 4.25% glucose dialysate)



Plain X-ray abdomen (A/P view) showing displaced CAPD catheter tip in the right lumbar region.



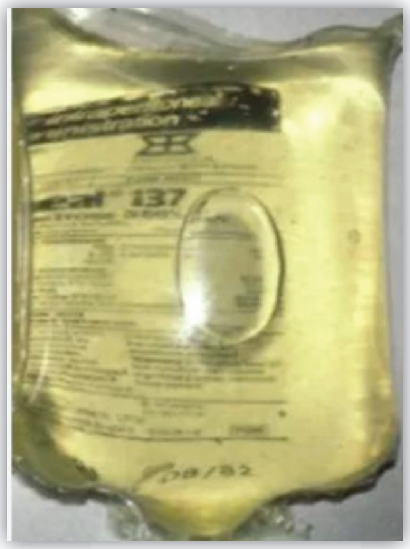
Chylous:
High triglycerides
Lymphatic obstruction
Trauma
Abdominal lymphomas
Pancreatitis
Drugs (calcium channel blockers)



Cloudy:
Peritonitis
Intraperitoneal disease
(appendicitis, cholecystitis, bowel ischemia)
Retroperitoneal disease
(pancreatitis, renal cell carcinoma)
Drugs (vancomycin, amphotericin B)
Allergic reaction (increased eosinophils)



Bloody (hemoperitoneum):
Coagulopathy
Retrograde menstruation
Ovulation
Strenuous exercise
Ovarian cyst rupture
Adhesions
Catheter-associated trauma



Normal

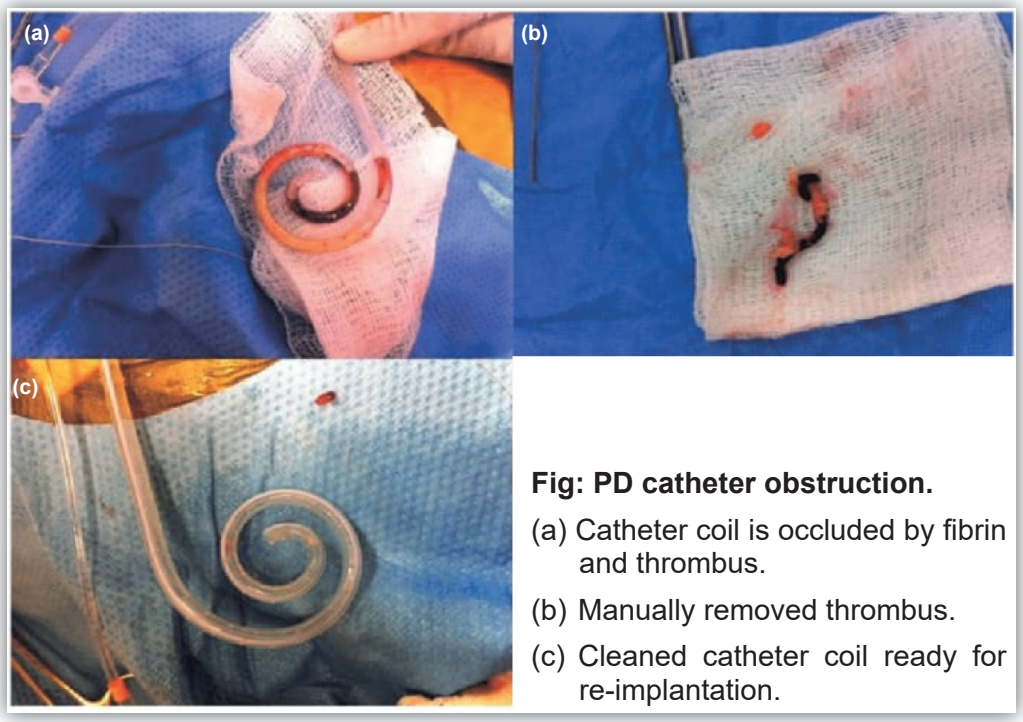


Fig: PD catheter obstruction.

(a) Catheter coil is occluded by fibrin and thrombus.

(b) Manually removed thrombus.

(c) Cleaned catheter coil ready for re-implantation.

Treatment considerations in managing diabetes in people on peritoneal dialysis

STEP 1: Known diabetic/new onset hyperglycemia after PD?

Glycated HbA,, is currently the preferred marker for long-term glycemic control assessment in people with diabetes on PD

STEP 2: Looks for alternative cause? anemia, erythropoietin treatment, and PD regime.

Maintain good life style along with diet plan for diabetic patient

STEP 3: : Oral hypoglycemic agent
Avoid-Sulphonylureas, metformin, SGLT2i, GLP-1 agonist
Use-DPP-4 inhibitors (linagliptin 5 mg daily, sitagliptin 25 mg daily, alogliptin 6.25 mg daily, and saxagliptin 2.5 mg daily)
Pioglitazone (dose 15 mg or 30 mg) can be used in advanced CKD

STEP 4: Insulin treatment
Best: subcutaneous insulin
Avold: IP insulin (risk of peritonitis)

- Short acting insulin prior to each exchange along with long-acting insulin
- Calculate the dose: 0.5 units/per kg as total starting dose with 50% of this dose as basal insulin and 50% of dose as prandial/bolus premeal insulin
- Additional 2 unit-1.36%, 4 unit-2.27%, 6 unit-3.86%
- Premixed 70/30 or 75/25 insulin can be considered at the start of the PD exchange, with an additional dose in 12 hours if required
- After each exchange during daytime Additional doses of short-acting insulin 2 units can be given if high glucose levels (>15 mmol/1/270 mg/dl) are noted after each exchange
- Monitor blood sugar 1 hour after each bag "Avoid hypoglycemia

Volume Overload in PD

- **Intake**
  - excessive salt and water consumption
- **Output**
  - loss of residual renal function
  - use of the wrong dialysis fluid
  - failure of peritoneal membrane to respond (true ultrafiltration failure)
  - mechanical problems like leaks

Volume Overload in PD

Intake

- excessive salt and water consumption

Output

- loss of residual renal function
- use of the wrong dialysis fluid
- failure of peritoneal membrane to respond (true ultrafiltration failure)
- mechanical problems like leaks





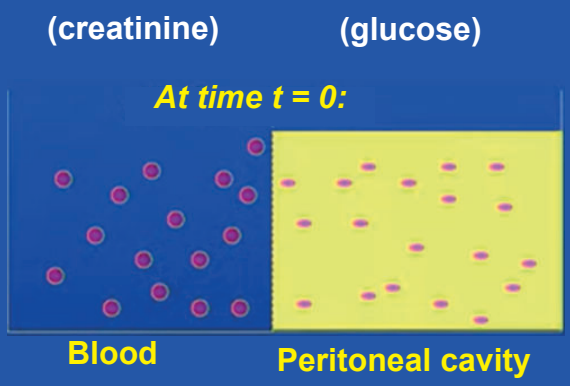
STATION 10

PD MEMBRANE DYSFUNCTION

Peritoneal Equilibration Test (PET)

- Assesment of peritoneal Transport capacity
- Speed of equilibration of solute conc. between plasma & dialysate
- 4 transport classes obtained by adding/subtracting SD from mean value
- The PET assesses both
  - small solute clearance (the D/P creatinine) and
  - ultrafiltration (ultrafiltration capacity)

The Peritoneal Equilibration Test (PET): A Way to Characterize the Peritoneal Membrane



The Peritoneal Equilibration Test

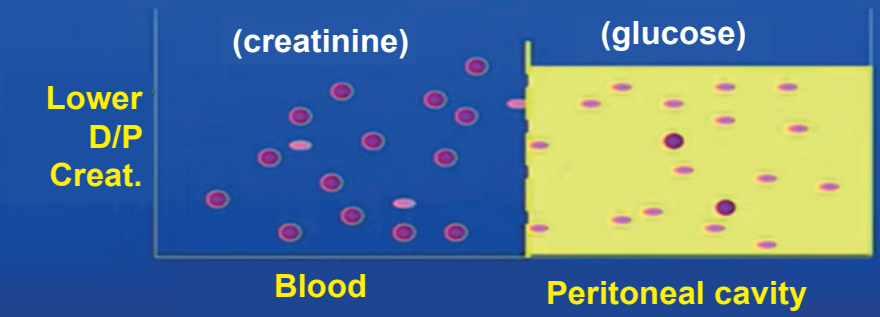
How easily does creatinine cross from blood to the peritoneal cavity?

- quantified as Dialysate [creatinine]
  Plasma (creatinine]
  or
  D/P creatinine (at T = 4 hours)

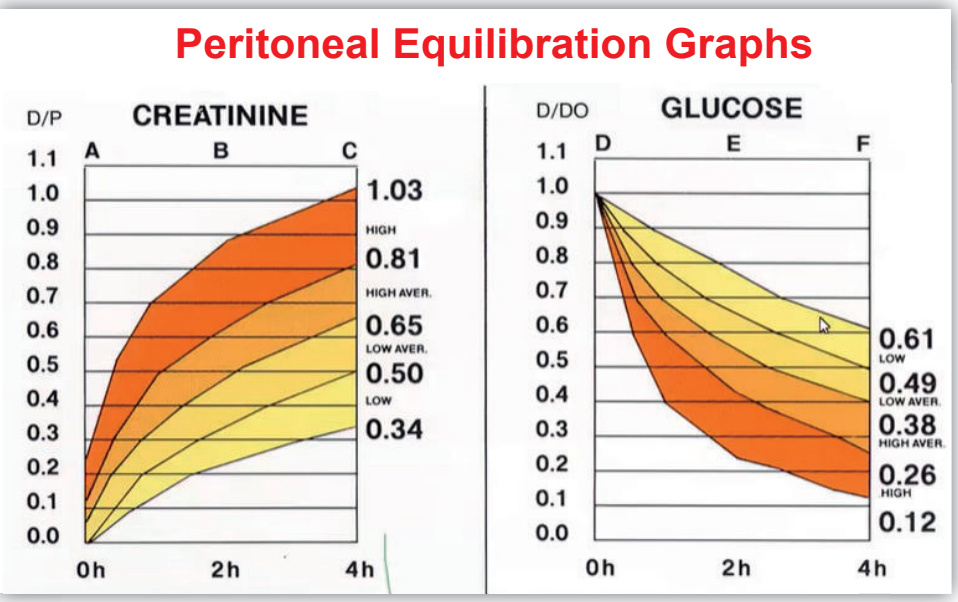
- **the "leakier" the peritoneal membrane, the higher the D/P creatinine**

The Peritoneal Equilibration Test (PET)
A Wat to Characterize the membrane

"tight" peritoneal membrane
(Slow transporter)



Peritoneal Equilibration Graphs



Categories of peritoneal membrane characteristics in PET

Mean+2SD	High
Mean+1SD	High average
Mean-1SD	Low average
Mean-2SD	Low

D/P creatinine

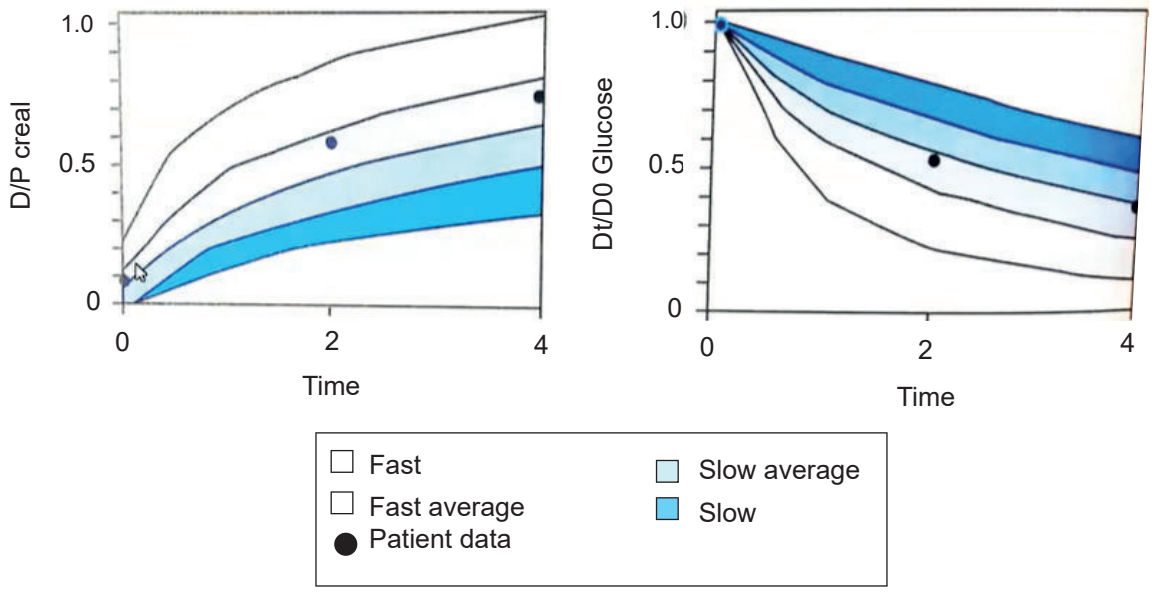
Mean+2SD	Low
Mean+1SD	Low average
Mean-1SD	High average
Mean-2SD	High

D/D0 glucose and UF volume

Peritoneal Membrane Characteristics

Membrane Type	4 hour D/P Creatinine	Characteristics
Hig	0.82-1.03	Very efficient membrane Transport solutes quickly Rapid glucose absorption May have difficulty achieving U.F. At risk for low serum albumin
High Average	0.65-0.81	Efficient membrane Transport solutes well Ultrafilters well
Low Averag	0.50-0.64	Less efficient membrane Transports solutes somewhat slowly Ultrafilters well
Low	0.34-0.49	Inefficient membrane Transports solutes slowly Difficult to obtain clearances when RRF 0. Ultrafilters very well

Hours	Plasma creatinine (mg/dL)	Dialysate creatinine	D/P creat	Dialysate glucose (mg/dL)	Dt/DO Glucose
0	-	0.9	0.1	2071.5	1.0
2	9.70	5.2	0.56	1050.0	0.51
4	-	6.6	0.71	698.00	0.34



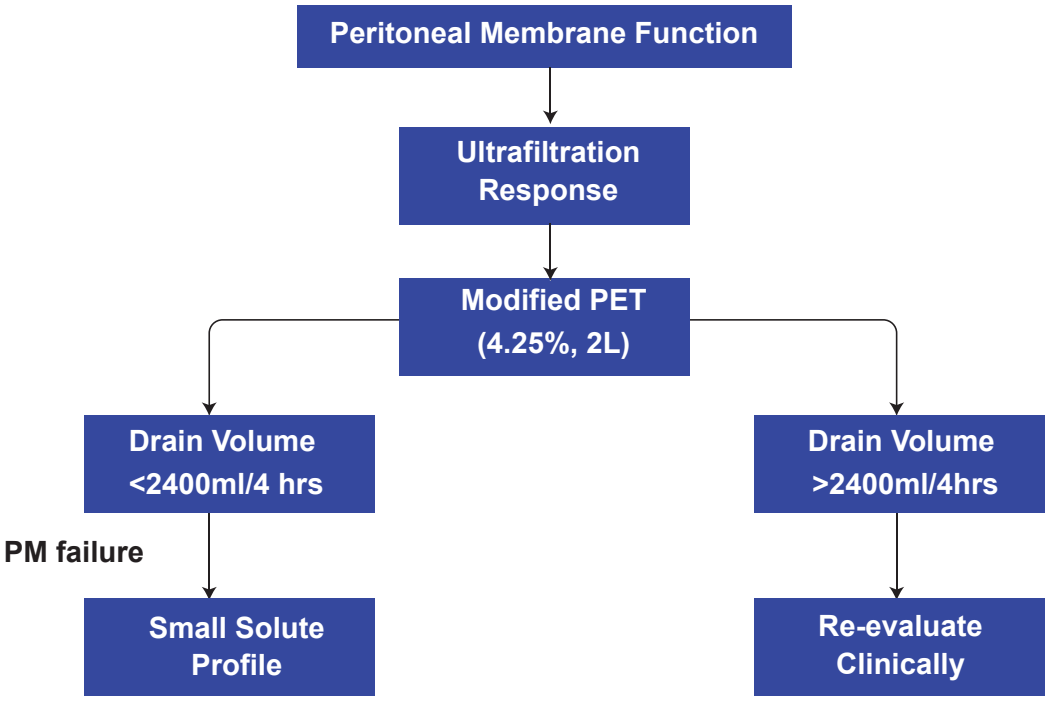
Guidelines for PET

- 1st PET at least 4-6 weeks after PD initiation
- Repeat annually (ISPD Guidelines)
- After resolution of a peritonitis episode, the PET should be deferred by at least 4 weeks and preferably for 8 weeks
- Early detection of change in PET characteristic
  - Neovascularization
  - Sclerosis
- Modify prescription & close FU to avoid adverse outcomes

Guide to Estimation of D/P

- Infuse 2.27% glucose 2L solution
- Drain after 4 hours and measure or weigh volume

Drain Volume in mL	Estimed Transport Status
<2100	High
2100-2300	High Avarage
2300-2700	Low Avarage
>2700	Low



Type 1 UFF

- Low Drain Volume with edema and high transporter (Type 1 UF failure)
- Most common type of UFF.
- Rapid loss of osmotic gradient due to absorption of glucose into blood.
- Hall mark is: New onset D/P creatinine > 0.81.
- Develops after a long duration of PD (3 yrs or more)
- Probable mechanism: increase in effective surface area due to vascularity (ANGIOGENESIS).

Management

- Shortening dwell time.
- Using automated (APD) night time exchange.
- High glucose concentration dialysate (4.25% D)
- Icodextrin (7.5%)
- Hemodialysis

Type 2 UFF: Low UF + low solute transport D/Pcr <0.5
(PD-associated swelling PDAS type2)

Multiple Adhesions	Peritoneal Sclerosis (Type II UFF)	Sclerosing encapsulating peritonitis



<1% of PD patients

Type 2 UFF

Mx of type 2 UFF

- Adjunctive HD or permanent transfer to HD
- High dose loop diuretics in subjects with RRF
- Pts with EPS: immunosuppressants such as steroids, azathioprine, MMF, CNI & mTORi tried with variable success
- Tamoxifen beneficial in EPS in some studies & may increase pt survival
- Severe form of EPS needs surgical enteroclysis (has high mortality risk).

Type 3 UFF (PD-associated swelling PDAS type3)

- Peritoneal lymphangiogenesis.
- Failure to achieve desired UF with icodextrin is usual clinical scenario.
- Icodextrin reabsorbed through lymphatics.
- Diagnosed by rate of reabsorption of dextran 70 or radiolabelled albumin from the peritoneal cavity.
- Patients have poor prognosis & need shifting to HD permanently.

Type 4 UFF (PD-associated swelling= PDAS type 4)

- Due to aquaporin deficiency.
- Loss of nearly 50% UF with aquaporin defects.
- Occurs in patients who have been on PD for > 4 yrs.
- Aquaporin transports water & not Na (sodium sieving or retention in blood)
- Sodium sieving: Initial fall of dialysate Na by 5-10 mmol/L with 4.25% D due to dilutional effect of UF through aquaporin.
- Type 4 UFF (PD-associated swelling= PDAS type 4)
- Diagnosed by comparing changes in dialysate Na after dwell of 60 minutes with 1.5% & 4.25% D.
- Result: Impaired initial fall in dialysate Na with 4.25% dextrose.
- The difference in dialysate Na is < 5 mmol/L between 4.25% & 1.5% dextrose PDF at 60 minutes.

Mx of Type 3 & 4 UFF (PD-associated swelling= PDAS type 3, 4)

- Decreased salt & water intake
- Diuretics
- Short dwell time
- Bethanechol (cholinergic agent) improves UF by contraction of diaphragmatic lymphatic stomata without change in transporter status
- Icodextrin may be useful in Type 4 UFF (induces UF by non aquaporin channels)

STATION 11

PD PRESCRIPTION

Emperical "incremental" PD prescription

- BSA 1.73 m2
- Fill volume 2 litres
- GFR
  - 10 ml/min: 1 exchange/day
  - 7 ml/min: 2 exchanges/day
  - 5-6 ml/min: 3 exchanges/day
  - <5 ml/min: 4 exchanges/day

CAPD	CCPD/APD
Manual exchanges. Usually 3 times a day. Fill volume: 2000 ml per exchange base on average BSA. Dwell time: 4 to 8 hours per exchange. Longer during sleeping time.	Exchanges by an automated machine (cycler). Usually 3 to 5 cycles +/- last fill (longest dwell) a day. Total cycler time: 8 to 12 hours. Fill volume: 2 to 5 L per exchange base on average BSA (more than CAPD fill, due to supine position). Usually performed while patient is sleeping.

Empiric Adult PD Prescriptions
Based on BSA and RRF - Prior to PET

CAPD, RRF > 2mL/min		
BSA	<1.4	3 x 20L
BSA	1.4-1.7	4 x 20L
BSA	<1.7	4 x 20L
BSA	1.7-2.0	4 x 2.5L
BSA	>2.0	4 x 30L
CAPD, RRF <2 mL/min		
BSA	<1.4	3 x 20L
BSA	1.4-1.7	4 x 20L
BSA	<1.7	4 x 2.5L
BSA	1.7-2.0	4 x 30L
BSA	>2.0	4 x 3L

Steps to increase peritoneal clearances

	L (D/P <0.5)	LA (D/P 0.5-0.65)	HA (D/P 0.65-0.81)	H (D/P>0.81)
Small (<1.71 BSA)				
Medium (1.71-2.0 BSA)				
Large (>2.0 BSA)				

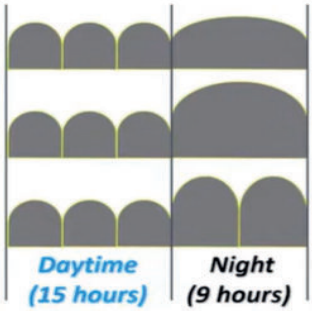
Increase number of exchanges

Increase fill volume

Relationship Between Dwell Time and Solute Transport /Ultrafiltration (UF)

Transport	Solute Clearance	UF	Prescription
High	++++	+	Short dwell
High Average	+++	++	CAPD/CCPD
Low Average	++	+++	CAPD/CCPD
Low	+	++++	Long dwell

Increasing Solute Clearance *CAPD*



Standard CAPD

CAPD with increase in instilled volume overnight

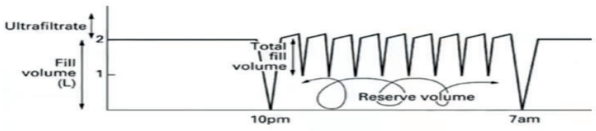
CAPD with NXD and increased overnight volumes

Tidal CAPD

Indications:
1. Infusion pain,
2. Drain pain,
3. Slow outflow of fluid.

How: Leave 5 to 50% of inflow fluid in abdomen.

Tidal Volume



Urgent start PD in ESRD

- Low filling volume in admitted patients.
- Always in Supine position.
- Use with cycler.
- Always there is a risk of leakage.

STATION 12

PD ADEQUACY

Adequacy of PD

Subjectively: presence or absence of shortness of breath and edema.

Objectively: presence or absence of edema, difference between actual and dry weight, raised JVP and raised BP, as chronic fluid overload causes HTN, LVH, cardiovascular morbidity and mortality.

Biochemical adequacy:

- Na, K, HCO3 levels in normal range.
- Ca, PO4 levels should be in normal ranges. But their levels are determined by factors other than dialysis.

Measurements of PD adequacy

- Measurements of weekly Kt/v: 1.7
- Measurements of Weekly creatinine clearance (CrCl) per 1.73 m2: 60 L.

Formula for Calculating Clearance in PD by Kt/V

Clearance, K= UV/P. Kt = K X time. In daily Kt/V, t = 1 day.
In weekly Kt/V, t = 7 days.
Total Kt peritoncal Kt + renal Kt
Peritoneal Kt = 24-hr dialysate urea /serum urea.
Renal K124-hr urine urea /serum urea.
V: volume of distribution of urea: 60% of body weight (male), 55% of body weight (female).

Formula for Calculating Clearance in PD by CrCl:

Total CrCl = peritoneal CrCl + renal CrCl
Peritoneal CrCl = 24-hr dialysate creatinine / serum creatinine
Renal CrCl (24-hr urine creatinine / serum creatinine + 24-hr urine urea / serum urea) x 0.5
BSA (DuBois formula):
BSA (m2) = 0.007184 x w0.425 x H0.725
where BSA body surface area (m2), W= weight (kg) a and H = height (cm)
CrCl total CrCl corrected for 1.7m² BSA.

A 50-year-old man weighing 60 kg has no residual renal function. He is on CAPD with four 2.5-L exchanges daily, and his net UF is 1.5 L. His V is 36 L, and his BSA is 1.66m2. Serum urea is 70mg/dl, and serum creatinine is 10mg/dl. The urea and creatinine in the 24-hr dialysate collection are 63mg/dL and 6.5mg/dL, respectively. Calculate his Kt/V and CrCI. Calculate his weekly kt/v and creatinine clearance.

Main formula = UV/P=VU/P=VD/P

Kt urea/d = 24-hr drain volume x D/P urea = 11.5 L X 63/70 = 10.35 L/d.

Daily Kt/V = 10.35 L/36 L = 0.288

Weekly Kt/V = 0.288 x 7 = 2.02

Creatinine clearance per day = 24-hr drain volume x D/P creatinine = 11.5 L x 6.5/107.48 L/d. Corrected for 1.73m2 BSA = 7.48 x 1.73/1.66 = 7.80 L/d.

Weekly CrCI/1.73m2 = 7.8 x 7 = 55 L/wk.

A 48-year-old woman on APD weights 63 kg and dose five 2.4-L night cycle plus a 6-hr 2-L day dwell. Her V by Watson is 32 L, and her BSA is 1.60m2. Her 24-hr dialysate drain volume is 15 L, indicating 1 L net UF. Pooled dialysate collection has urea level of 48 mg/dl and a creatinine level of 4.5 mg/dL.
Her mid-afternoon serum urea is 65 mg/dL, and serum creatinine is 9mg/dL. Her urinary urea and creatinine clearence are 2 and 4 mL/min, respectively. Calcululate her total weekly Kt/V and creatinine clearance.

Main formula = UV/P = VU/P = VD/P

Peritoneal Kt = daily drain volume x D/P urea = 15 L x 48/65 = 11.1L

Peritoneal Kt/V11.1 L/32L-0.35/d-0.35X7/wk = 2.45/wk.

Renal urea clearance = renal Kt urea = 2 mL/min = 20 L/wk.

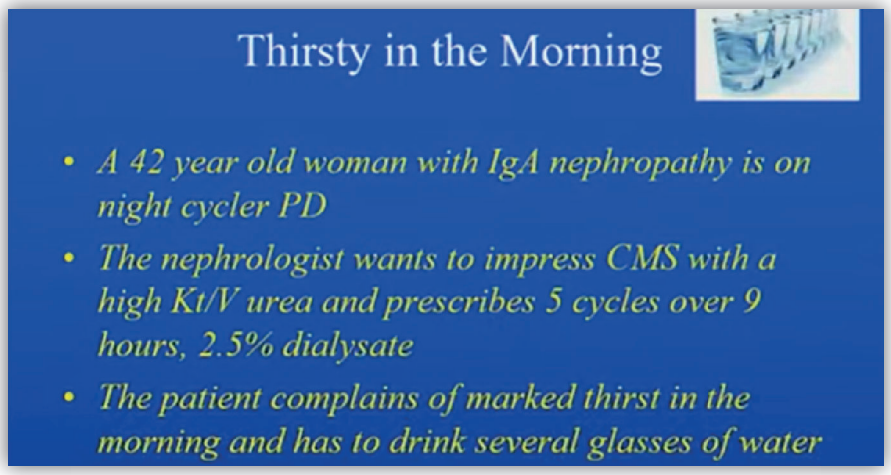
Renal Kt/V = 20/32 = 0.63/wk.

Total Kt/V peritoneal plus renal Kt/V = 2.45+0.633.08/wk

Peritoneal creatinine clearance = daily drain volume x D/P creatinine + 15 L X 4.5/9 = 7.5 L. Corrected for 1.73m2 BSA-7.5 x 1.73/1.60 8.1 L/d=57 L/wk.

Renal creatinine clearance (for this purpose) = mean of renal urea and renal creatinine clearance = mean of 2 and 4 mL/min = 3mL/min = 30 L/wk. Corrected for 1.73m2 BSA=30x 1.73/1.60 = 32.4 L/wk

Total creatinine clearance = 57+ 32.4 = 89.4 L/wk.



Choose the Best Answer

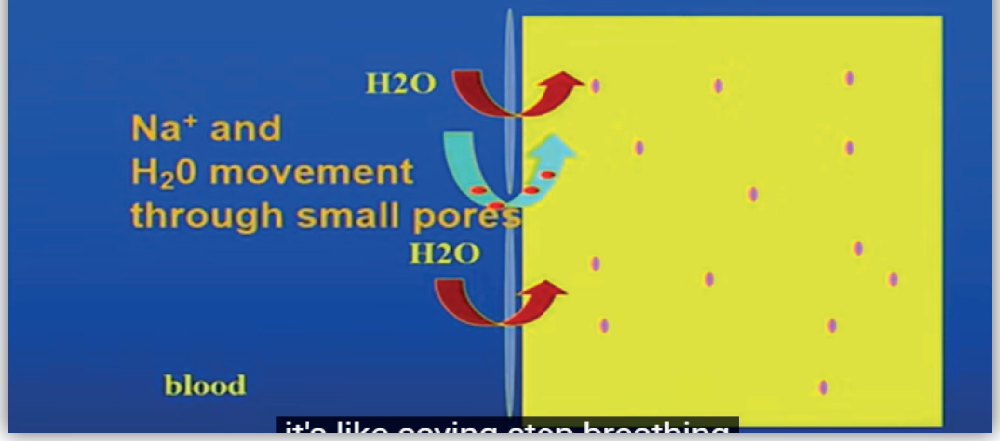
A. The sleep apnea syndrome seen in dialysis patients leads to mouth breathing and thirst.

B. The patient may be hypernatremic in the morning because of sodium sieving on PD.

C. The glucose absorption increases the serum osmolality and drives thirst.

D. The morning thirst is the result of resetting of the osmostat because of the cycling PD.

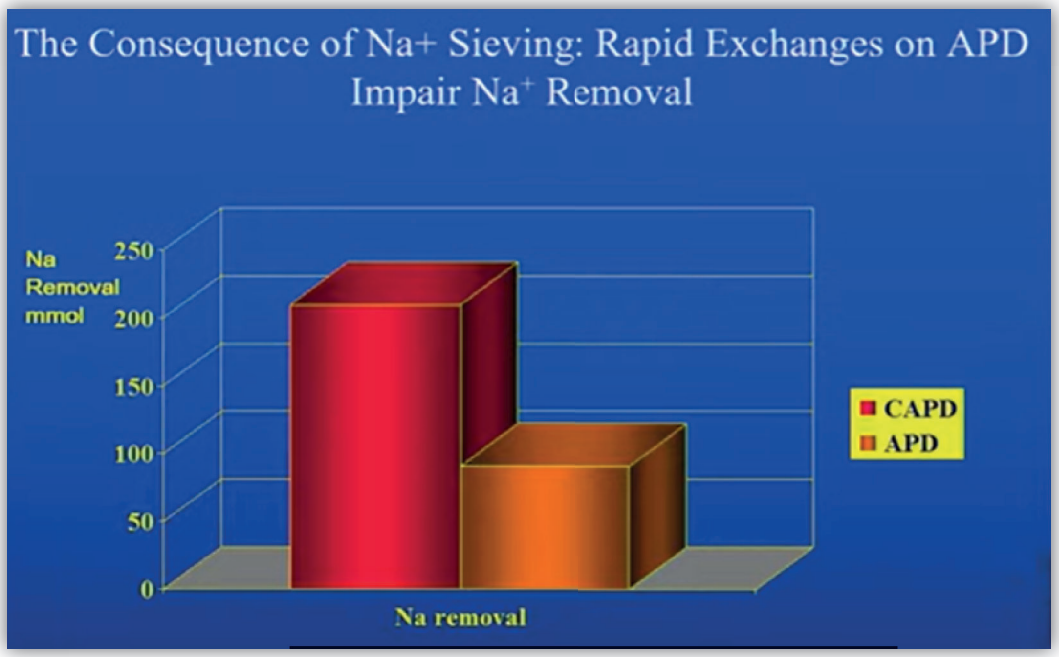
The Concept of Sodium Sieving



it's like saying stop breathing

Sodium Sieving

- *more water than sodium moves into the peritoneal cavity at the beginning of UF*
- *sodium is held back or sieved at the aquaporin*
- *sodium diffuses into the dialysate more slowly via the intercellular pores*
- *short dwells will lead to more water than sodium removal*


The Consequence of Na+ Sieving: Rapid Exchanges on APD Impair Na+ Removal
Na Removal mmol
250
200
150
100
50
0
Na removal
CAPD
APD

STATION 13

FOOD AND NUTRITION OF A PD PATIENT

PD allows you to enjoy a relatively more freedom on diet.

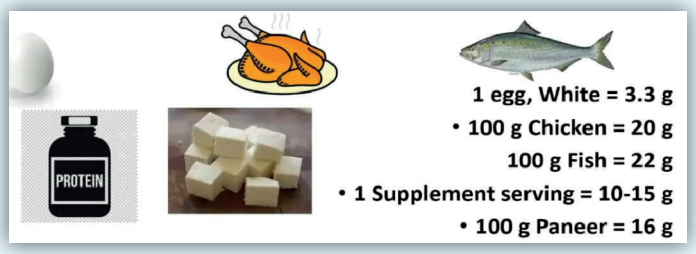
Getting Adequate Calories

- 25-30 Kcal per Kg IBW
- Peritoneal dialysis fluid contains sugar; patient may have a tendency to gain weight.
- If patient is diabetic, dosage of insulin or other medications may need to change.

Getting the right amount of Protein

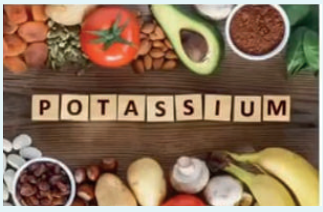
- Protein requirement is difficult to achieve with diet alone.
- The protein loss varies from 6-12 grams per 24 hrs. To compensate for protein loss, 1.2-1.5 g proteins per kg per day is recommended.
- High biological value proteins and nutritional supplements can help the patient to reach the desired intake.

Sources of protein



Potassium

- Many patients do not need to restrict potassium at all due to continuous clearance, and some may need to deliberately eat high-potassium foods due to low potassium count.
- However, a few may need to restrict their potassium. It is advisable to eat low-potassium food liberally and high-potassium food in moderation.



Phosphorous

- Clearance of phosphate is not particular effective with either PD or conventional HD
- Diet alone is rarely enough to control phosphorus; a supplementation of phosphate binders is often required.
- Binders are effective only when taken with the meal as it works by preventing Phosphorous to be absorbed in the blood steam after the food is being digested.



Sodium

The allowance may differ with the type of dialysis.

- Hypertensive patients should have aggressive sodium restriction.
- In PD total dietary sodium allowance can be between 2.5-4 gm per day.
- Sodium is connected to fluid intake and how much fluid your body holds on to; if you eat foods high in sodium you will get thirsty and drink more fluid.
- Food rich in sodium are table salt, pickle, papad, salted biscuits and all canned foods.



Fluids

- Patients with substantial fluid output do not require fluid restriction.
- They lose water up to 2 L/day by ultrafiltration depending on the dextrose concentration of dialysate.
- Fluid restriction is required only if volume of urine goes down.

Nutritional Requirement- HD Vs PD

Nutritional Parameters	Haemodialysis	Peritoneal Dialysis
Calories (Kcal/kg/day)	30-35	25-30
Protein (g / kg / day)	1.2	1.5
Sodium (mg/day)	2500	2500-4000
Potassium (mg/day)	1500-2000	Restriction only if hyperkalemi
Protein Loss	6-9 g per session	9-12.5 g per 24 hrs
Phosphorous (mg/day)	800-1000	Less than 1200
Fluids (ml / Day)	500 ml +previous day urine output	500 ml +previous day urine output + Ultra filtration

STATION 14

PD POSTER

CAPD

নিজ ঘরে নিজের ডায়ালাইসিস

- পেরিটোনিয়াল ডায়ালাইসিস হলো কিডনী ফেলিওর-এর একটি বিশেষ চিকিৎসা।
- এক্ষেত্রে নাভীর নীচে বা পাশে অবশ্ করে একটি নরম ক্যাথেটার স্থাপন করা হয় এবং এর একটি অংশ পেটের বাইরে চামড়ার নীচে থাকে।
- পেরিটোনিয়াল ডায়ালাইসিস করার জন্য একটি বিশেষ পানি ক্যাথেটারের মাধ্যমে পেটের ভিতর প্রবেশ করানো হয়। এই পানি শরীর থেকে কিডনী রোগে জমে যাওয়া দূষিত পর্দার্থ বের করে নিয়ে আসে।
- ৬ থেকে ৮ ঘন্টা পর পেটের এই পানিকে ক্যাথেটার এর মাধ্যমে বের করে ফেলা হয়। রোগী পেটের মধ্যে পানি নিয়ে স্বাভাবিক সব কাজকর্ম করতে পারেন।
- এই চিকিৎসা সিনিয়র সিটিজেন, যাদের শরীর এবং হার্ট দুর্বল তাদের জন্য অধিক উপযোগী।





পেরিটোনিয়াল ডায়ালাইসিসের সুবিধাসমূহ

১. বাসায় বসে স্বাধীনভাবে করা যায়

২. সুঁই ফোটানোর ভয় নাই (ব্যাথামুক্ত)

৩. রক্তচাপের উঠানামা হয় না। কিডনি ও হার্টের অবশিষ্ট কাজ তুলনামূলক ভালো থাকে।

৪. খাবার, কাজকর্ম, ব্যস্ততায় এবং ভ্রমণে স্বাধীনতা থাকে

৫. সপ্তাহে ২-৩ বার হাসপাতালে যাওয়ার প্রয়োজন নাই

৬. অধিক পরিবেশবান্ধব

৭. এই চিকিৎসা থেকে হেপাটাইটিস বি এবং সি ভাইরাসে আক্রান্ত হওয়ার ঝুঁকি নাই

৮. পেরিটোনিয়াল ডায়ালাইসিসের চিকিৎসা খরচ আপাতঃ দৃষ্টিতে কিছুটা বেশি মনে হলেও হিমোডায়ালাইসিস সংক্রান্ত সকল খরচের তুলনায় প্রায় সমান

এই ব্যাপারে আপনার কিডনীর ডাক্তারের সাথে কথা বলুন।

হিমোডায়ালাইসিস



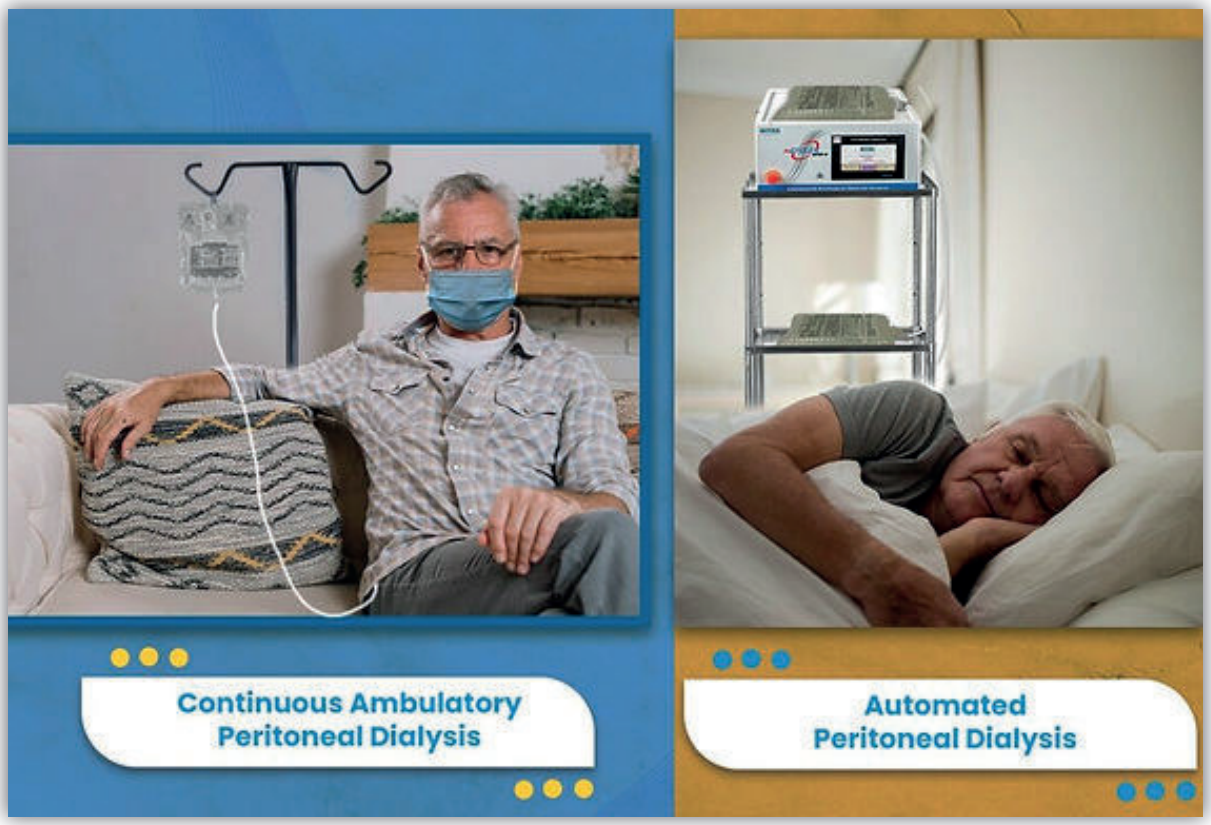
পেরিটোনিয়াল ডায়ালাইসিস

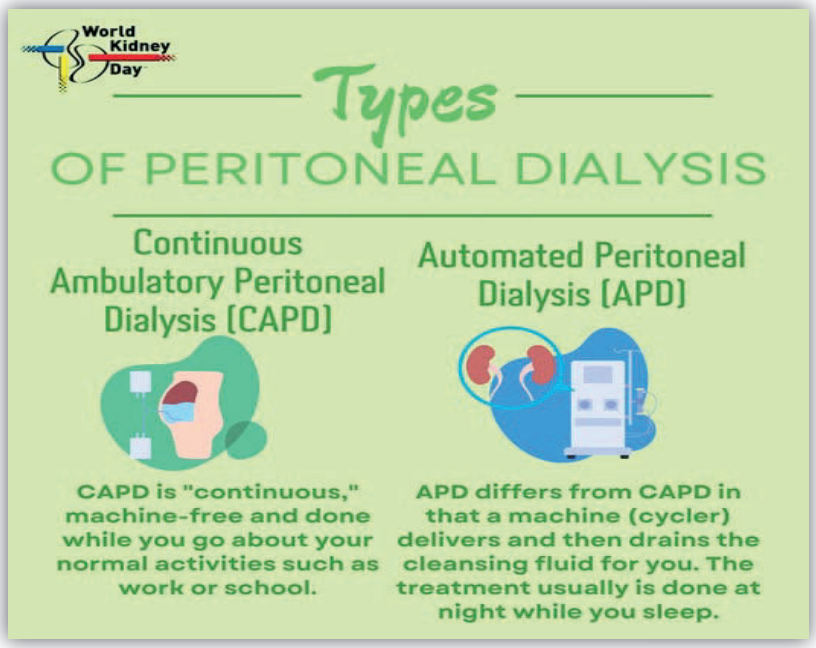


প্রচারে বাংলাদেশ সোসাইটি ফর পেরিটোনিয়াল ডায়ালাইসিস

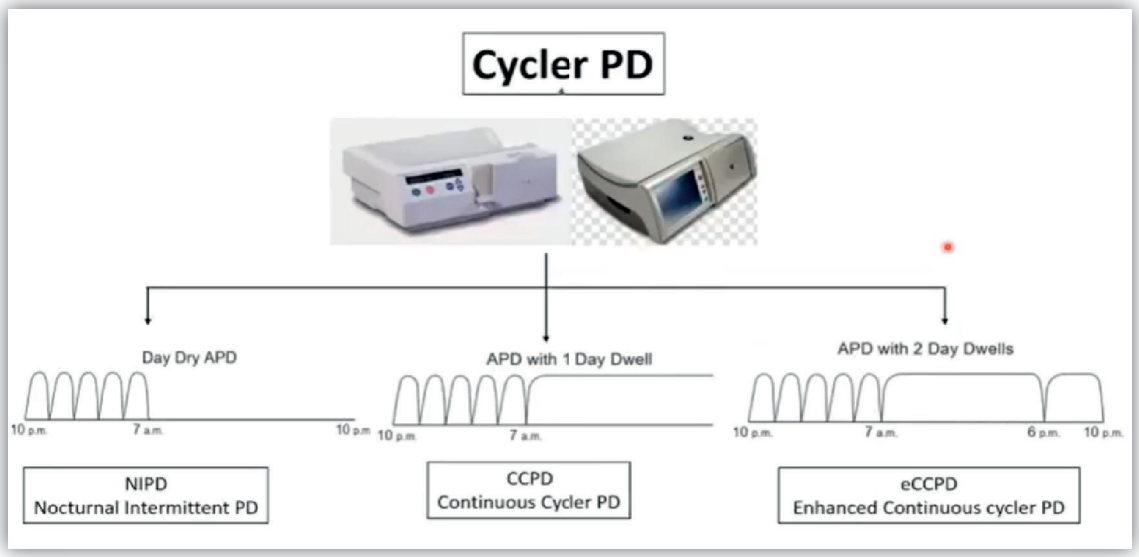
STATION 15

APD MACHINE








Cycler PD
Day Dry APD
10 p.m.
7 a.m.
10 p.m
APD with 1 Day Dwell
10 p.m.
7 a.m.
APD with 2 Day Dwells
10 p.m.
7 a.m.
6 p.m.
10 p.m.
NIPD
Nocturnal Intermittent PD
CCPD
Continuous Cycler PD
eCCPD
Enhanced Continuous cycler PD

STATION 16

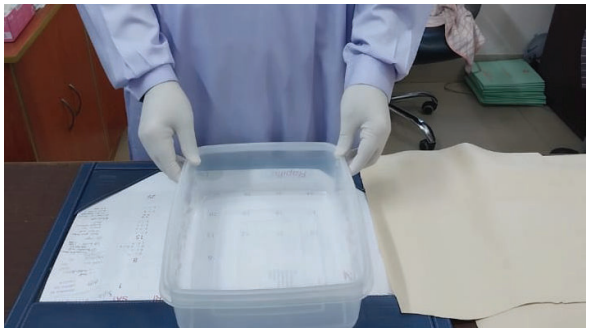
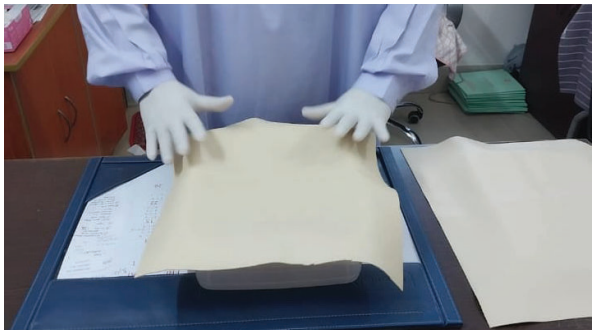
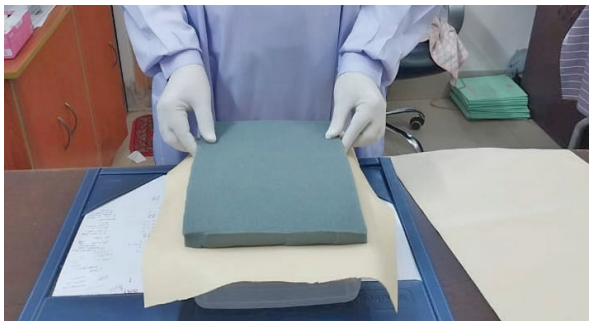
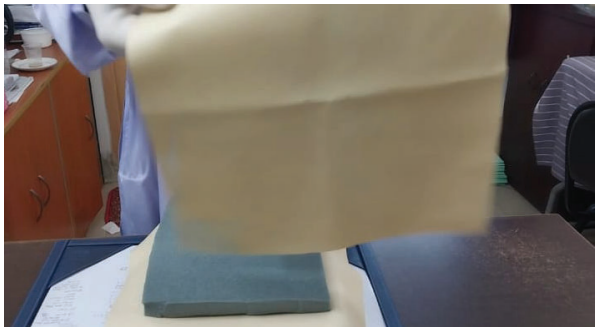
PD OF PEDIATRIC PATIENTS

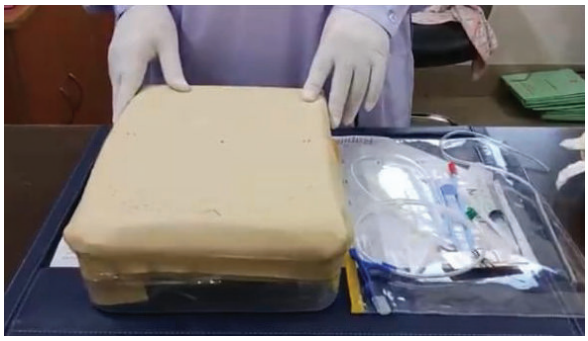




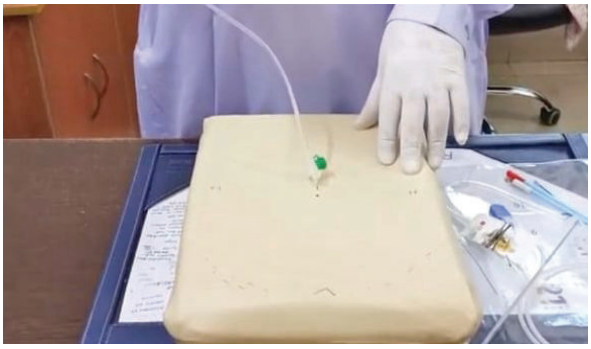
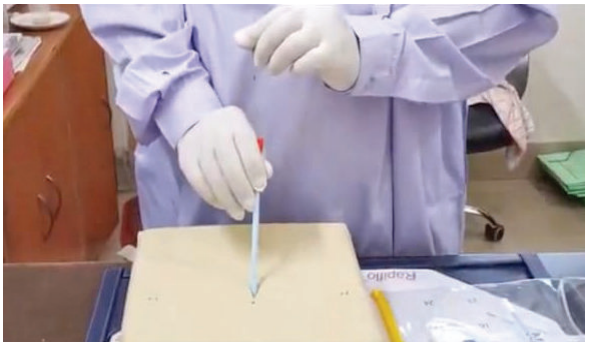
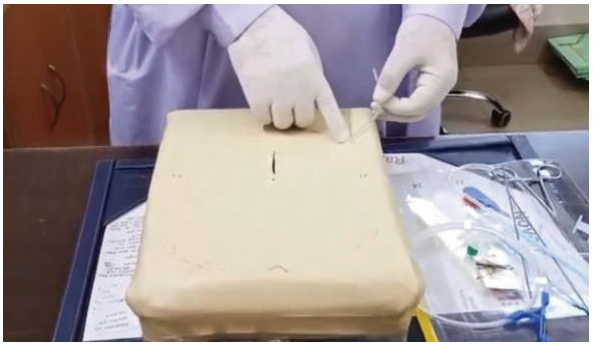
CHAPTER 02

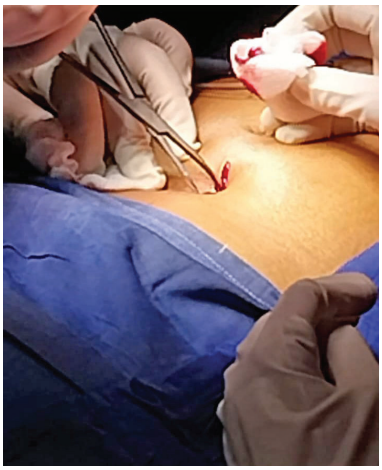
Hands on training of PD catheter insertion

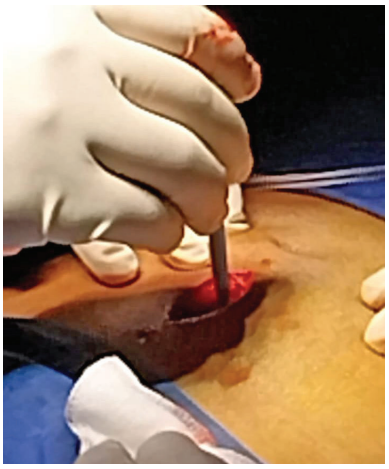





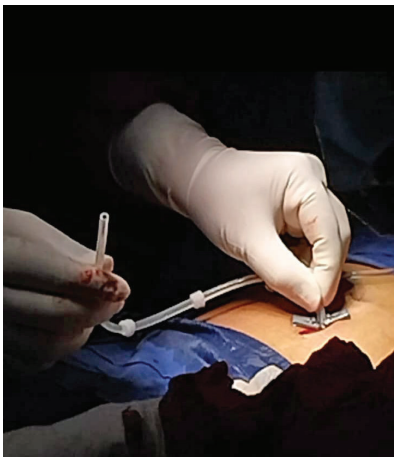
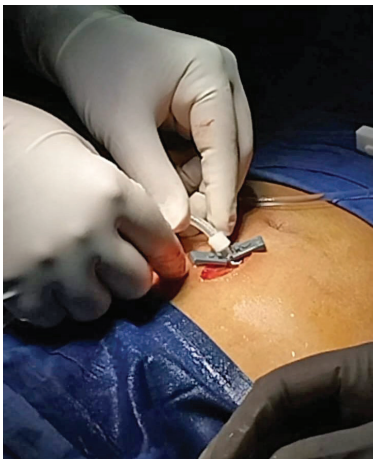











Sitting in the drawing room,
playing chess with his wife,

being absorbed or spending
joyful moments—

the picture was not like this.

both his kidneys had failed.


and only one question
was on his mind:


He regularly supervises
building repairs,


he is still hardworking.


he chose the right treatment
at the right time.

CHAPTER 03

Typical Case Presentation on CAPD



Typical Case Presentation on CAPD

- Patient Mr Aminul Isalm
- 68-year-old gentleman
- An upzilla chairman
- Dinazpur, Bangladesh.
- admitted in a renal center with the complaints of generalised swelling and decreased urine for the last 2 weeks.
- The patient was apperently normal till his 44 years of age (in 2000).
- On his routine evalution, he was diagnosed to have diabetis mellitus for which treatment was started with oral anti-diabetic medicine.
- Two years later, his blood sugar was found high for which, insulin was started, with which sugar was controlled.
- 3 years later (in 2003) he has found to have hypertension, which was controlled with single anti-hypertensive medication. Currently he needs 2 anti-hypertensive medication.
- 3 years later (in 2006) in his regular follow-up, he was found to have high serum creatinine level. He was evulated and was told to have protein leakage in urine and his kidney disease was secondary to underlying diabetes.
- At that time he was evaluated for visual problem and was told to have diabetic retinopathy. He was treated with injection in the eyes in a eye hospital.

- He remembered that at that time his serum creatinine was around 1.5mg/dl.
- 2 years later (in 2008), he had complaints of chest pain for which he consulted cardiologist, evaluted, underwent CAG, told to have block in coronary vessels and underwent PTCA.
- Just after PTCA, patient renal function was worsened (serum Creatinine increased to 2.2) and was managed conservatively.
- His serum creatinine subsequently decreased to some extent at the time of discharge.
- 8 years later (In 2016), patient had similar complaints of chest pain, for which he was evaluted and, underwent CAG and then CABG operation in a cardiac hospital after consulting a nephrologist.
- Patient can not remember his serum creatinene at that time, but it was higher than the previous reports. Since than he was on regular F/U.
- In 2020 patient had fever, cough and breathlessness for which he was admitted in a medical college hospital and diagnosed to have COVID pneumonia, treated and was discharged after 16 days. At this time his serum creatinine was increased to 4.5 mg/dl.
- After 2 years (In 2022), patient had decreased appetite, nausea, pallor and bilaterral pedal edema for which he was evuluated and told to have severe renal failure. His serum creatinine was 9 mg/dl.
- Due to uremic symptoms, he was advised for RRT. He was counseled for PD due to having coronary heart disease with PTCA and CABG and risk of HD. Patient aggreed for PD.
- CAPD catheter was inserted in a renal hospital by nephrologist with local anesthesia in May 2022.
- 2 weeks later PD was started.
- Patient's initial emperical PD prescription was....

Dwell fluid- 1.5% Dextrose,

Dwell volume -2 liters,

Dwell time - 4 hours,

Number of cycles: 3 cycles per day.

He had ultrafiltration of 600ml and residual urine output of 1000 ml.

He was discharge with advice for F/U after 1 month.

- 1 month later of starting CAPD, routine Peritoneal Equilibrium Test (PET) was done, but he could not remember the report.
- Post PET, his prescription was changed.
- No history of PD fluid leakage from PD catheter insertion site.
- He had constipation which was corrected with laxatives.
- No history of decreased urine output.
- Patient was on fluid restriction and low salt intake.
- Patient CAPD prescription was revised.
  Fluid-2 cycles of 1.5% Dextrose, 1 cycle of 2.5% Dextrose.
  Dwell volume -2 liter each,
  Dwell time - 4 hours each (total 12 hours) daily.
  Rest 12 hours: Dry abdomen.

He had residual urine output of 1000 ml and ultrafiltration was increased to 800ml.

He is capable of doing manual exchanges by himself.

There was no pain during inflow and outflow (drainage) of the dialysate.

- 6 months later (Jan 2023), he had complaints of pain abdomen, fever with chills and cloudy effluent of PD fluid for 1day.
- There was no history of pus discharge, redness at the exit site.
- He was admitted and was told to have infection in the abdomen and was treated with intraperitoncal antibiotics for 2 weeks and was discharged.
- There was no change is ultrafiltration during this episode of infection, as he remembered.
- 1 year later (January, 2024), he got poor outflow of fluid. At that time his x-ray abdomen showed catheter displacement in upper abdomen, likely due to constipation. It was corrected shortly after treating constipation with enema. Now his bowel habit is 1 to 2 motions per day after regular taking of laxatives.
- He is currently continuing with his previous PD prescription for the last 2 years.
- Currently had residual urine output of 800 ml/day. No history of bladder disturbances.
- Ultrafiltration of 650ml/day.
- No history of anemia or blood transfusion in past.
- For the last 2 months he has bilateral lower limb swelling.
- No history of breathlessness, orthopnea, and features suggestive of PND.
- No history of decreased urine output.
- No history of pain abdomen or cloudy effluent.

Past medical history

- Known case of IHD with PTCA and subsequently underwent CABG about 9 years back.

Personal history

- Diet - mixed types of food with less animal protein and more plant protein, vegetables and fruits.
- Appetite is less.
- Bowel habits- on and off constipation.
- No smoking and alcoholism.
- Sleep - normal.

Family history

- Family history - He was blessed with 2 sons and 1 daughter. His father had DM and hypertension.
- There is no known history of kidney disease in family members.

On physical examination,

- Patient is edematous. Bilateral pitting pedal edema extending above knees.
- Pulse is 80 beats/min, regular.
- BP 125/75 mm Hg with 2 antihypertensive drugs.
- CAPD catheter with healthy exit site in right lower abdomen. There is a 4 cm mid-line below umbilicus scar mark suggestive of catheter insertion site. Fluid thrill and shifting dullness are present due to PD fluid in peritoneal cavity.
- A vertical mid-sternal incision of previous CABG. CVS examination is normal.
- Respiratory system examination revealed bi-basal crepitation.
- Fundoscopy showed DR in both eyes.
- There is also sensory predominant peripheral neuropathy in both lower limbs.

Diagnosis:

- DKD, HTN,
- CAD with post-PTCA and CABG,
- DR, PN,
- ESRD on CAPD with volume overload.

CHAPTER 04

Brain storming on troubleshooting of 10 common PD related complications

Question 1.

- A 68-year-old business man came to you with loss of appetite, nausea, pallor and pruritus. He has DM for the last 25 years, hypertension for 20 years, and CKD 15 years. He also informed you that he has got "3 rings" in heart 10 years back and also by-pass surgery 6 years before. Now his serum creatinine is 7 mg/dl.
- Why CAPD will be the best option as RRT?

A. PD will give him more freedom in RRT.

B. He has got PTCA and CAGB.

C. PD may be more economic, compared to HD in corporate hospital.

D. PD will favour his residual kidney function.

Question 2.

- Which statement is false regarding "percutaneous catheter insertion by practicing nephrologists"--

A. a shorter 'break-in" period (from 2 weeks to 3 days),

B. very low mechanical and infective complications,

C. requirement of expensive OT and operating time,

D. more contribution to growth of PD.

Question 3.

- PD catheter was inserted and CAPD was started after 2 weeks (break-in period). The emperical PD prescription may be (multiple options may be selected)....

A.1 exchange/day, if GFR 8-10 ml/min.

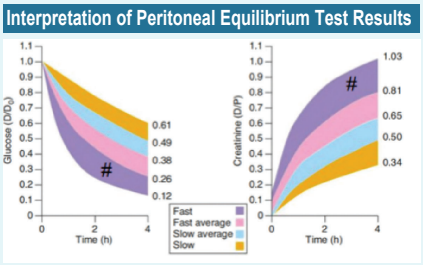
B. 2 exchanges/day, if GFR 7 ml/min.

C. 3 exchanges/day, if GFR 5-6 ml/min.

D. All of the above.

Question 4.

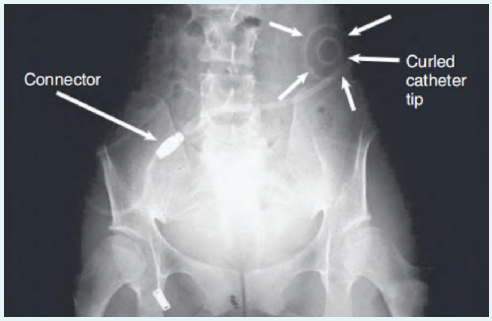
Q. One month after starting PD, routine PET test was done which showed that the patient is fast peritoneal membrane transporter. What would not be the appropriate treatment?



A. APD at night.
B. Short dwelling PD.
C. Icodextrin for 12 hours dwell.
D. Transition to HD

Question 5.

Q. About 1 year later the patient noticed poor out-flow for 1 day. Plain x-ray abdomen was done. What would be the primary effective treatment of the patient?



A. Correction of constipation with laxative or enema.
B. Giving heparine in the catheter.
C. Laperoscopic correction of catheter migration and fixation to abdominal wall.
D. Removal of the catheter.

Question 6

Q. This patient on PD for last 2 years presented to PD clinic with pain and tenderness, marked erythema and discharge from the exit site. Exit site infection (ESI) was suspected. Which statement is NOT true regarding the treatment?



A. Initial treatment should be with oral flucloxacillin.
B. Extension of the infection into the tunnel may be assessed either clinically or by ultrasound.
C. Hospitalization, parenteral antibiotics, and often urgent catheter removal are required if there is evidence of spread into the tunnel.
D. If the infection is with MRSA, eradication should be attempted with injectable flucloxacillin.

Question 7.

- 2.5 years after starting PD, the patient developed abdominal pain and fever for 1 day. Effluent fluid was cloudy. PD peritonitis was suspected. What is NOT the parameter for diagnosis of PD peritonitis?

A. Dialysis effluent WBC > 100 / microL,

B. >50% PMN leucocytes,

C. Positive dialysis effluent culture,

D. Dialysis effluent protein is >10 gm/dl.

Question 8.

- Best management strategy of PD peritonitis
  DOSE NOT include--

A. Intraperitoneal (IP) route is the best.

B. All antibiotics can be given simultaneous in the last PD bag of the day.

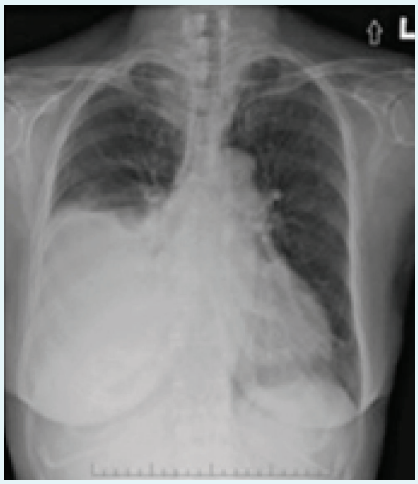
C. PD fluid with antibiotics should be dwelled for at least 1 hour in abdomen.

D. Prophylactic antifungal drug may be added orally.

Question 9.

Q. Chest X-ray of a patient with shortness of breath 1 week after PD initiation showed moderate right-sided pleural effusion.

Biochemical analysis showed glucose concentration is 50 mg/dl is higher than simultaneous blood glucose. Diagnosis: PD related hydrothorax was made. Which treatment option is more rewarding?



A. Peritoneal rest for 2 to 6 weeks may seal the communication.

B. Low pressure PD with cycler.

C. Pleurodesis with tetracycline or autologous blood.

D. Video-assisted surgical repair with thoracoscopy was undertaken.

Question 10.

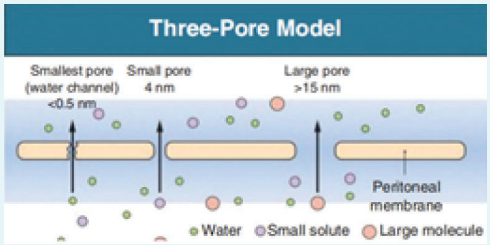
Q. Which statement is NOT true regarding "Three-Pore Model"?

A. Small pores (4 nm) represent the major pathway of small solutes and water clearance.

B. Large pores (>15 nm) represent the pathway of protein or albumin clearance.

C. The smallest pores (<0.5 nm) are permeable to water and salt.

D. The smallest pores are responsible for 50% water loss.



CHAPTER 05

Abstracts of the Speeches

Title **CAPD in Bangladesh - Past, Present & Future**



Prof. Dr. M. A. Samad
MBBS, MD (Nephro), FCPS (Medicine), FRCP (Glasgow, UK)
Anwer Khan Modern Medical College Hospital.
President, Bangladesh Society for Peritoneal Dialysis (BSPD)

- Perspective: Bangladesh - approx. 300 nephrologists, very low number considering the prevalence of kidney disease. 1 nephrologist for every 0.8 million people, highlighting a significant need for more specialists in the country. 35,000 - 40,000 incidence of ESRD/year. Urban population 40%, 75% Doctors work here. Rural population 60%, 25% Doctors work here.
- Epidemiology of CKD: Prevalence of CKD in adult 16-26%. Incidence of ESRD 35 – 40 thousand/year. 20 to 30% initiate Dialysis but 80 discontinue within 3 months. Less than 10% can afford Rx cost. Almost 90% Pt. die without treatment.
- Beginning of CAPD in Bangladesh: 13th January, 1997. Indications of CAPD were HD instability- 57.08%, far distance- 16.53%, patients chosen- 12.99%, vascular access problem- 13.38%. Twin bag with 2 litre exchange, 3 times in a day Double cuff Tenckhoff catheter used mostly in open dissection technique under L/A. Peritonitis – 1/19.46 pt mo, exit site infection 1/53 pt mo. Survival on CAPD was 1 Year 63%, 2 Years 48%, 3 Years 31%. (M. A. Samad et al. Continuous ambulatory peritoneal dialysis: Experience in Bangladesh. Indian Journal of Peritoneal Dialysis: volume 10, 2006.)
- Present: Over the last 10 years, effort has been made to popularize CAPD in Bangladesh. In 1998 the number of new patients starting CAPD was 15. In 2022, prevalence has increased to 2802, with 152 new patients starting CAPD in 2022. The incidence of peritonitis has decreased from 1 in 14 patient months in 2003 to 1 in 34 patient months in 2010. A recent study in 2023 revealed a peritonitis rate of 1 episode in 43patient months.
- Barriers to CAPD in Bangladesh: Financial constraints, lack of knowledge & motivation among physician, nurses and PD care givers and patients, undue fear of peritonitis and concern doing unsupervised exchange, inadequate diagnostic facilities, lack of information about benefits of CAPD among patients, poor housing condition.
- Key strategies leading to PD first in BD:
- Financing Strategy: Government can buy bulk amount of PD fluid at low cost and deliver to PD patients with subsidized price.
- Unbiased Counselling: Govt. may employ health workers for counselling of patients about benefit of PD.
- Govt. Industry: Government can setup industry to manufacturing CAPD fluid to distribute free of cost.
- Increase the capacity of PD centers: CAPD Training and Technology Centre should be established in each region across the country.

Future: There are tremendous opportunities to expand CAPD in Bangladesh. Most of the dialysis centers are in the capital and in large cities. Due to lack of facility, a vast number of rural and semi-urban populations are unable to travel long distances to avail HD. Hence, CAPD can be an available and effective form of therapy in this group of population.

Title

Technique Matters: Insights into PD Catheter Insertion Methods Blind vs Open Surgical Technique



Professor Dr Sarwar Iqbal
MD (Nephrology) FRCP (Edinburgh UK)
Senior Professor of Nephrology in Popular general Hospital, Dhaka.

Background: Peritoneal dialysis (PD) depends on a well-functioning catheter, making the insertion technique crucial for long-term success. Mechanical complications, catheter migration, and early failure are often linked to how the catheter is inserted.

Aim of the presentation: To compare blind percutaneous insertion and open surgical placement, focusing on mechanical outcomes, early complications, and suitability for urgent-start PD.

Key content: Content was synthesized from ISPD guidelines, observational studies, and procedural descriptions. Key parameters reviewed included complication rates, catheter survival, and feasibility in various clinical settings.

Peritoneal dialysis (PD) success depends seriously on reliable catheter function, making the choice of insertion technique a vital determinant of outcomes. This review compares blind percutaneous insertion with open surgical placement by examining mechanical performance, early complications, and suitability for urgent-start PD. The blind approach is fast, inexpensive, and feasible at the bedside. However, the absence of visual guidance increases the risk of bowel injury, catheter malposition, poor drainage, leakage and early catheter failure requiring repositioning or removal. The open surgical technique offers direct visualization of the rectus sheath and peritoneum, allowing precise placement and secure fixation. This reduces migration, obstruction, and leakage, and enables safe same-day initiation of PD using low-volume protocols. Comparative evidence from ISPD guidelines and cohort studies consistently shows fewer early mechanical complications and higher primary catheter survival with surgical insertion. Overall, while the blind technique provides accessibility and speed, the open surgical method delivers superior mechanical reliability, safer early outcomes, and better support for urgent-start PD. Strengthening surgical expertise therefore remains essential for centers aiming to improve long-term PD program performance.

Conclusion: Blind insertion offers speed and accessibility, but its complication profile limits performance. Open surgical placement consistently provides better positioning, fewer early failures, no leakage and greater suitability for urgent-start PD. For centers building strong PD programs, strengthening surgical expertise offers clear long-term benefits.

Title

Preservation of Peritoneal membrane- what is new ?



Prof. (Dr.) Kazi Shahnoor Alam
Professor of Nephrology
Sir Salimullah Medical College, Dhaka.

Structural and functional alteration of the peritoneal membrane occurs after long term peritoneal diagnosis. Membrane failure leading to ultrafiltration failure (UFF) can happen around 23 to 30% patients in long term PD. UFF has been found related to the development of anatomic alterations such fibrosis, hyalinizing vasculopathy (HV). Although the mechanism of peritoneal fibrosis is not completely understood, the main facts are repeated episodes of inflammation associated with peritonitis and long term exposure to bioincompatible PD fluids. Glucose Possibly in combination with lactate and glucose degradation products (GDPs) are likely to be the most toxic constituents of dialysate . The mesothelial cell has been proposed as the main cell implicated in the pathogenesis of peritoneal damage. A number of strategies have been proposed to preserve the peritoneal membrane . Reducing peritoneal exposure to glucose, GDPs and lactate are found very promising . Peritoneal resting , replacing glucose-based fluids with amino acid-based fluids and icodextrine based dialysate , using bicarbonate as buffer have been found effective. Anti inflammation and anti fiboitic agents may play some role protecting the peritoneal membrane.

Title

Role of incremental peritoneal dialysis in the management of end stage renal disease.



Dr. Md. Shoeb Nomany
Associate Professor of Neprology
Kidney Foundation Hospital & Research Institute, Dhaka.

- Incremental PD (IncrPD) was first recognized in the 1990s and has recently gained widespread attention.
- In Italy, 29% of patients start PD with an incremental approach, and 51% of patients are on incremental PD at a single Canadian academic center.
- Incremental PD is generally defined as the strategy of dialysis prescribing less than “full dose” at the start of PD due to having residual kidney function (RKF), and gradually increasing afterward to compensate for ongoing loss of RKF to achieve better solute clearance.
- Starting dialysis with 1 to 2 exchanges a day and increasing up to 3 to 4 exchanges a day (full-dose) if needed, could be an acceptable method of RRT. Therefore, IncrPD needs shared decision-making with the patients.
- Incremental PD is a green modality of dialysis, as less water (2 to 8L daily) and no electricity are consumed here, compared to HD (200L water for one session of HD).
- Incremental PD prescription also ensures slower decline in RKF, peritoneal function, ejection fraction of heart and loss of memory due to more hemodynamic stability, less intensified treatment and more physiological approach.
- This offers patients with more freedom and flexibility in daily routines and can allow for smooth transition in future.
- This lowers the treatment cost and burden at the beginning of dialysis with improved quality of life.

At a glance, the advantages associated with IncrPD are

- P-Reduced risk of peritonitis and other complications.
- Q-Quality of life is better.
- R-Better preservation of residual kidney function.
- S-Reduced sugar or glucose exposure.
- T- Less chance of technique failure. Better bridging therapy to renal transplantation.
- U- contribution to green Universe.
- V- Value or costing of treatment is relatively low.

Title

Longevity in Peritoneal Dialysis (PD) Patients



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Longevity is defined and reflects both patient and technique survival after dialysis initiation.

Determinants of longevity are multifactorial including, patient factors (age, diabetes mellitus, cardiovascular disease, nutrition, residual renal function etc), adequacy target, prevention of infections, and most important peritoneal dialysis care giver and center practices.

Unfavorable determinants include the peritonitis rate, cardiovascular , psychosocial burnout and other comorbidities.

Strategies includes a holistic approach as per the patient status at initiation of PD, RAAS blockade, volume status, psychosocial support, prevention of infections etc.

Future Directions include, AI-based prescriptions, biomarker-guided membrane monitoring, low-GDP solutions, hybrid PD-HD models, and regenerative therapies.

Take-home Message:

PD longevity depends on patient selection, infection prevention, RRF preservation, and center excellence. The future is personalized, data-driven, and home-empowered.



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Professor Talerngsak Kanjanabuch, MD, is a global leader in nephrology and Director of the Center of Excellence in Kidney & Metabolic Disorders at Chulalongkorn University, Bangkok. As Secretary-General of the Nephrology Society of Thailand (NST), he advises national health bodies including the MoPH, NHSO, and Thai FDA. Internationally, he chairs the ISPD Asia-Pacific Chapter and ISN Oceania & South-East Asia Regional Board, contributing to multiple ISPD and KDIGO Guidelines. His research, spanning >200 peer-reviewed articles, >100 book chapters, and >9,000 citations, focuses on PD, CKD and GN. He has engaged major multicenter PD trials—PDOPPS, SONG-PD, SHARP, STEP-PD, ISPD-GREX—and pioneered Thailand's "PD First" policy, and PD accreditation framework. A dedicated mentor with >35 postgraduate and international fellows, his work bridges science, policy, and education, driving equitable and evidence-based kidney care across the Asia-Pacific.

Title

PD for AKI in ICU Settings



Dr. Urmila Anandh
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About one-third of patients in ICUs develop AKI in India. In this subgroup of patients some form of dialysis is needed in8-17% and an overall mortality of approximately 60% is noted. In advanced countries multiple forms of hemodialysis (SLED, CRRT etc,) are often the modality of choice. However, in resource constrained nations both the availability of infrastructure and finances limit the universal use of hemodialysis modalities. There are many studies where peritoneal dialysis (PD) is the modality offered to patients in ICU. For instance, in young babies, following surgery for congenital heart disease, a PD catheter is often inserted intraoperatively as these children have a high post-operative incidence of AKI. Similarly, even in many pediatric ICUs, PD is often the first modality of renal replacement therapy.

The utilization of PD in the adult ICU is comparatively lesser with the advent of multiple therapeutic innovations which has led to safer delivery of dialysis in the critically ill patients. Also, with newer dialysers which remove and or adsorb cytokines/ toxic substances/ bilirubin etc extracorporeal treatment modalities are used extensively in ICUs. In our part of the world PD is slowly losing its therapeutic value as we incorporate practices from the western world. There are many instances PD can benefit patients with AKI in our setting.

a) patients with cardiorenal syndrome
b) patients in whom vascular access is an issue
c) patients with high risk of clotting and bleeding with anticoagulation
d) patients with decompensated liver disease
e) patients with raised intra-cranial pressure

There are many benefits of PD in AKI patients especially in the critical care setting as depicted in the figure.

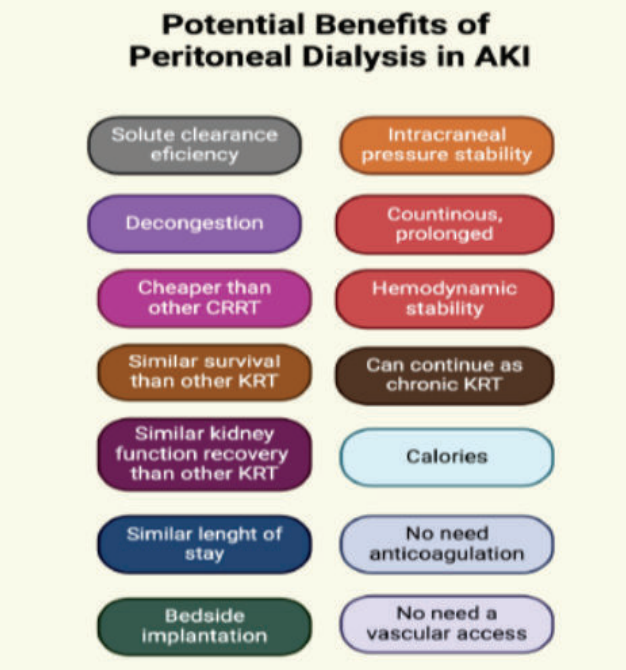


Fig: *Benefits of PD in AKI*

Usually, PD is often offered as intermittent PD as was done in the past, however with the availability of skilled interventionist/surgeon a Tenchkoff catheter can be inserted bedside and an urgent start PD can be initiated. For small rapid exchanges an automated peritoneal dialysis machine can be used.

In conclusion, PD can be a valuable modality of RRT in the ICU and if used in the right setting can overcome many challenges of dialysis delivery in developing countries.

Title

Assisted Peritoneal Dialysis; Filling voids in ESKD care



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Peritoneal dialysis (PD) should be made available to all eligible individuals with kidney failure who are considering ongoing dialysis treatment. Many patients opt for PD as it can be administered at home, giving them greater independence compared to in-center hemodialysis (HD). In numerous regions, PD is emphasized because it provides comparable health outcomes and is frequently less expensive than in-center HD. However, many individuals with kidney failure are older, frail, or have additional physical or cognitive impairments, which can hinder their capacity to manage self-care PD. Additionally, some patients may lack family support for PD. Offering assistance can help address these challenges, allowing more individuals to access PD, making assisted PD an essential approach that enhances patient choice and offers broader access to home dialysis. This talk aims to outline the concept of assisted PD for this statement, discuss key elements of assisted PD, and provide recommendations for increasing its global availability.

Key words: Peritoneal Dialysis (PD), Home Dialysis, Physical Impairments, Cognitive Impairments, Barriers to Self-care PD, Self-care PD

Title

SRI LANKA



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Sri Lanka faces a growing burden of end-stage renal disease driven by chronic kidney disease of both known and unknown causes, with many CKDu-endemic areas located in rural districts where human and physical resources are scarce. Even in early 2010, patients' access to renal replacement therapy was largely limited to haemodialysis in major cities. To change this trajectory, the Ministry of Health introduced continuous ambulatory peritoneal dialysis (CAPD) as a public sector initiative, first as a pilot in Kandy and subsequently in rural Girandurukotte, with multisectoral support. The effort was strengthened through the International Society of Nephrology Sister Center partnership with Stanford University.

Despite significant challenges, including community-level constraints, the COVID-19 pandemic, economic pressures, and product-quality setbacks, the program has delivered meaningful access to home-based dialysis and improved continuity of care. Sri Lanka's experience by having more than six hundred patients in ten centers, demonstrates that with collaboration, decentralization, and focused training, CAPD can be scaled in low-resource, CKDu-affected settings, offering a practical model for countries facing similar realities.

Title

DEALING WITH INFECTIOUS COMPLICATIONS OF PD



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Peritonitis

Definition:

1) clinical features consistent with peritonitis, include abdominal pain and/or cloudy dialysis effluent;
2) dialysis effluent white cell count > 100/mL (after a dwell time of at least 2 h) with > 50% neutrophils;
3) positive dialysis effluent culture.

Cause Specific Peritonitis:

Includes culture negative, catheter-related peritonitis and enteric peritonitis

Time Specific Peritonitis:

Includes Pre-PD peritonitis, PD related peritonitis and PD catheter insertion related peritonitis.

Outcome-Specific Peritonitis:

Includes complete resolution, refractory, recurrent, relapsing and repeat peritonitis.

Prevention of Peritonitis:

1. Catheter placement (role of prophylactic antibiotics)
2. Exit-site care
3. Role of prophylactic antibiotics before surgical procedures and interventions
4. Training evaluation & re-training
5. Other modifiable factors

Investigations:

Sample Collection: Method, storage of sample. Criteria of peritonitis in CAPD and APD.

Novel diagnostic techniques

Treatment:

Empiric Treatment: Selection of antibiotic (gram + and gram- cover) and route (IP/ IV)
Dosage of commonly used antibiotics
Prevention of side-effects
Special considerations regarding the stability of antibiotic IP
Special considerations in APD
Subsequent management of Peritonitis (according to culture & sensitivity)
Treatment of outcome-specific and important cause-specific peritonitis
Adjuvant agents

GOOD LUCK FOR OUR FUTURE PD LOVER NEPHROLOGISTS.



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