Home Hemodialysis & Peritoneal Dialysis
What do you already know about kidney disease?
Kidney disease

• Non-institutionalised adults: 4.4 million people worldwide who suffer from kidney disease, or, 1.9% of population.
• Annual growth rate is 8%.
• 6 to 10 times higher in patients between the ages of 70 to 90 compared to ages 30 to 50.
• These numbers do not reflect the pediatric population.
Who is affected?

- The growth is influenced in part by diseases associated with the aging population.

- Diabetes and high blood pressure are leading causes of ESRD.
What do kidneys do?

- Clean the blood
- Remove extra fluid
- Keep your body chemicals in balance
- Filter out waste products
- Control blood pressure
- Help make red blood cells
When kidneys start to fail:

• Signs of uremia may appear.
• Symptoms include:
  – Loss of appetite
  – Headaches
  – Bad taste in your mouth
  – Trouble concentrating
  – Nausea/vomiting
Treatment Options

• When kidneys fail, these are the following treatment options:
  – Dialysis
  – Transplant
  – No treatment
Dialysis Options

• 1. Peritoneal

• 2. Hemodialysis
What would you do?

• Dispatched Priority 4 for a pt c/o weakness and low BP reading of 102 systolic.
• Upon arrival, the patient is unresponsive.
• Patient remains connected to the Hemodialysis machine.
• Access via a fistula to his left arm.
What would you do?

- Dispatched Priority 4 for a pt c/o chest pain and SOB.
- Upon arrival, the patient is unresponsive.
- Patient remains connected to the cycler via a peritoneal dialysis catheter to the right side of his abdomen.
Home Dialysis

• Home dialysis includes 2 different types of dialysis:
  – Home Peritoneal Dialysis (PD)
  – Home Hemodialysis (HD)

Peritoneal Dialysis Video: <2mins

https://www.youtube.com/watch?v=7dvwY-KzWoU
How does Peritoneal Dialysis Work?

• PD works inside the body, using the peritoneal membrane, or abdominal lining, as a natural filter to remove waste from the bloodstream.

• Specialized solutions help to enhance fluid removal, meet nutritional needs, replace amino acids lost during dialysis and neutralize acid levels in the body.

• There are different types and concentrations of solutions used that also help remove water.
Peritoneal Membrane

• Porous, delicate layer of tissue plentiful in blood vessels
• Acts as a dialyzing membrane, permitting wastes to cross it and empty into the PD solution in peritoneal cavity.
  – Size 1-2 square meters/approximates BSA
  – Highly vascular
  – Semi-permeable /bi-directional
  – Kidneys lie retroperitoneal
Types of PD Therapy

• There are 2 types of peritoneal dialysis that patients will do independently, with little to no assistance:
  – CAPD - Continuous Ambulatory Peritoneal Dialysis
  – CCPD – Continuous Cycling Peritoneal Dialysis aka Automated Peritoneal Dialysis (APD)
What’s the difference?

**CAPD**
- Done every 4 – 6 hours throughout the day with a longer hold at night
- Each exchange consists of a fill, dwell and drain
- Gravity assists with filling and draining
- NO machine is involved; works by gravity

**CCPD**
- Connected to a machine called a “Cycler” while patients sleep; usually for 8 – 12 hours
- The machine does each exchange automatically: drain/fill/dwell
CAPD & CCPD
The PD Catheter

• Small plastic tube inserted into the peritoneal cavity
• One or two cuffs
• Straight or coiled
• Multiple holes in last few inches
Solution exchange: infusion procedure

- Liver
- Stomach
- Duodenum
- Transverse Colon
- Ascending Colon
- Sigmoid Colon
- Ileocecal Valve
- Small Intestine
- Rectal Divagin
- Rectum
- Bladder
- Ureters
- Medication Port
- Solution Container
Patient

PD Catheter

Transfer Set
The Catheter
Transfer set (twist clamp)
Transfer Set

• Transfer Set allows the dialysis solution to enter and leave the body
• Mini Cap has a proviodine sponge that sterilizes the end, a new cap is applied after each use
• Twist clamp – opens and closes transfer set tube
Cycler
Patient on Cycler
Specialty Solutions - Extraneal

• Patients with insulin-dependent diabetes may require modification of insulin dosage as solutions used contain dextrose.
• Appropriate monitoring of glucose should be performed
• Some glucometers give falsely high glucose levels.
WARNING...GLUCOMETERS

• These patients’ home glucometers have been checked for compatibility by the Nephrology team, therefore if a glucose level needs to be done it is safest to use their own glucometers if possible.

• Know that if you use non compatible glucometers, it may give a false high reading therefore interfering with your treatment.
What to do when you must transport a patient to hospital?
For CAPD Disconnect

• Close the twist clamp
• Clamp the tubing leading to the fill and drain bags.
• Disconnect the patient tubing from the bag tubing.
• Secure patient side tubing and cover with sterile abdominal pad.
PD Disconnect

- Close twist clamp on transfer set
- Most important step
Twist Clamp – Open or Closed?
PD Disconnect

• Disconnect tubing from Transfer set

• Notice clamp to fill and drain lines

• Apply new mini cap to Transfer set
Mini-Cap

Centre for Prehospital Care
Health Sciences North
PD Disconnect

- Twist Clamp
- Clamp
- Luer Lock connections
- Clamp
If required….Clamp, Cut and Run!

• Clamp extension line clamp patient PD catheter (twist or roller clamp), Clamp both fill and drain lines and then cut clamps. DO NOT cut transfer set or PD catheter.

• If able, aseptically apply a minicap to transfer set instead, ensuring catheter is clamped.
Emergency PD Disconnect
CCPD Disconnect

• Turn the main power switch off at the back of the Cycler.
• Close the twist clamp
• Disconnect the patient tubing from the machine tubing
• Screw one of the sterile mini caps onto the patient side tubing
• Secure patient side tubing and cover with sterile abdominal pad
If required….Clamp, Cut and Run!

• Turn main power switch off at the back of the Cycler.

• Clamp extension line (from cycler), clamp patient PD catheter (twist or roller clamp), then cut between clamps. DO NOT cut transfer set or PD catheter.

• If able, aseptically apply a minicap to transfer set instead, ensuring catheter is clamped.
Main Power Switch
Keep in mind...

• That peritonitis is a serious risk for peritoneal dialysis patients.
• Cutting the patient PD catheter can result in the patient no longer be able to receive PD.
• It’s a good idea to secure the tubing with a sterile ABD pad!
Home Hemodialysis

• Dialysis is done through a vascular access. (short video <2mins) https://www.youtube.com/watch?v=shFSW8VE3Gs

• There are 3 different access types:
  • Fistula
  • Graft
  • Central line
AV Fistula
Arteriovenous (AV) Fistula

- Involves vascular surgery usually in the patient’s non-dominant arm
- Usually involves a joining (anastomosis) of the cephalic vein to the radial artery
- Preferred method as it poses less risk of infection or clotting
- Takes 4-6 weeks to “mature”
How does it work?

• In order to perform dialysis, blood needs to be withdrawn at a high rate
  – (approx 200 - 400 ml per min)
• At that rate it would cause venous collapse
• The best way to prevent this collapse is to join an artery to a vein in the wrist or forearm.
How does it work?

• By creating a fistula, the vein gets a little bit bigger and a little bit thicker permitting repeated access and blood withdrawal at the required rate

• two needles are inserted into the fistula, one to draw blood and one to return it.

• The "arterial" needle draws blood from the "upstream" location while the "venous" needle returns blood "downstream".
Fistula accessed for Dialysis
AV Graft
AV Graft

• When veins and/or arteries are too small or will not permit a fistula, an artificial vessel can be surgically inserted
• Graft may be synthetic (Teflon) or animal donor
• Higher risk of thrombosis and infection
• Works on the exact same principle as a fistula
• Much quicker to “mature” (2 weeks)
AV Graft

Looped graft
Artery
Vein
Surgical anastomosis
Central Line
Central Line

• Least preferred method for Hemodialysis
• Usually used for Emergency or short term dialysis
• Consists of plastic catheters inserted usually into the Vena Cava via the internal Jugular
• Popular with patients because it does not involve needles
• Increased risk of thrombosis, infection, scarring and narrowing of the vein
Home set-up
How it works

• Once blood access is obtained, the blood circuit is filtered through an artificial kidney.

• The kidney has 2 functions:
  • Waste product removal
  • Fluid removal
Hemodialysis
Artificial Kidney
Home Hemodialysis

• The blood circulates at a flow between 200-400ml/min.
• The dialysate circulates at a flow between 300-800ml/min
• Treatment time is between 3-5 hours for short daily and 6-8 hours for nocturnal.
• Nocturnal is done while the patient is sleeping.
Safety devices

• Home hemodialysis patients have safety devices they must put in place with each dialysis.
  – Hemodialert, detects blood if the venous needle dislodges.
  – Safety clamps, locks lines in place at luer lock connections on fistula extension sets and catheter lumens.
  – Zircon, detects water leaks from either Domus or R/O.
Patient on Domus

Emergency Dialysis D/C Kit
Emergency D/C Kit

Emergency Dialysis D/C Kit for a fistula or graft
Emergency D/C Kit Cont..

Emergency Dialysis D/C Kit for Central Line (note the dead end caps)
What to do when you must transport a patient to hospital?

• Keep in mind that the access flow of a fistula or graft can be as high as 500ml/min.
• When patients remove their needles, they must hold pressures until the sites seal, usually around 10 minutes.
• Low BP is a common risk for hemodialysis patients as dialysis removes water.
Emergency Dialysis Disconnect

• Turn main power switch off at the back of the Domus (toggle switch). (Pic on the next slide)
• Apply clamps to bloodlines, then cut between clamps.
• DO NOT cut central line catheter.
• Secure the lines to the patients arm with tape.
• If able, aseptically attach saline filled syringes to fistula extension sets or central line and flush.
Back of Domus- On/Off Switch

ON/Off Switch

ON/Off Switch
Clamp, Cut, Secure and Run!
Cardioversion/Defibrillation

• When dialysis machine is in use, defib or cardioversion cannot be done as dialysate flows through the artificial kidney, water is a major component of dialysate.

• You must clamp and cut the lines to secure the patient and all other individuals at the scene before proceeding with defibrillation.
Common Reasons for 911 Calls

• Infection, general malaise, feeling unwell (i.e. abdominal pain, fever, nausea, vomiting, redness at exit site, cloudy bag)

• Signs & symptoms of fluid overload: shortness of breath, chest pains

• Cardiovascular signs & symptoms (i.e. chest pain, shortness of breath, irregular pulse rates)

• Bleeding (i.e. AV access, Central Venous Cath)
Assessment Questions for Quick Patient Information

• Do you see a kidney specialist?
• Do you know their name?
• Do you have a tube in your neck, arm or belly?
• Do you have fluid in your belly?
• Do you produce urine?
• Are you on dialysis (i.e. Home or in Hospital)?
How does this fit within your scope of practice?

• In the ALS PCS preamble under “Home Medical Technology and Novel Medications”

• A policy has been developed and will be circulated once approved by CPC Council and QCC

• This is an emergency procedure (i.e. Heimlich Manoeuver) that does not require a medical directive
Nephrology Care / Emergency Care

• Nephrologists are on-call 24/7

• In-centre Hemo Unit (Mon - Sat 0700-2400hrs)

• Nurse on call Mon – Sat 2400-0700hrs and Sundays

• Satellites (Mon – Sat)

• Home Dialysis / Transplant / PRI (Mon – Fri)

Always access via HSN Switchboard