Cvvhd full form

Introduction access to principles sites of CRRT dialysis artificial diffusion dialysis ultrafiltration pre/post dilution role classification of the hustle and bustle of filters in the role of elimination of diffusion in the classification role of Hemofiltration in eliminating used therapies 1. Intermittent dialysis treatments are provided for short intervals, usually every day or every 2-3 days as required (e.g. intermittent hemodialysis or perital dialysis). Ongoing re kidney replacement therapies (CRRT) are dialysis treatments provided as a continuous 24-hour treatment. This program online will focus only on continuous hemodialysis circles (as opposed to continuous bird dialysis). Both intermittent hemodialysis and continuous hemodialysis circuits use the same principles. Blood is removed from the patient, pumped through a dialysis filter and returned to the patient after excess water and waste is removed. The filter performs many of the functions of the kidney nephron unit, and therefore, it is referred to as an artificial kidney. The main difference between intermittent and lying treatments is the speed at which water and waste are removed. Intermittent hemodialysis removes large amounts of water and waste in a short period of time (usually over 2-4 hours), while ongoing treatments for kidney replacements remove water and waste at a slow and steady rate. While intermittent dialysis allows chronic kidney failure patients to limit the amount of time they are hooked up to a machine, rapid removal of water and waste during intermittent treatments may be poorly tolerated by hemodynamically unstable patients. 2. Access Historically, early circuits removed blood from arterial access sites and returned the purified blood using a rose catheter. This promoted blood flow through the filter by utilizing the patients' own arterial to gradual verdi blood pressure. Although access sites from companion arteries are still used in patients with end-stage kidney failure, pressure transitions from borrower arteries are no longer needed. Intermittent continuous hemodialysis circuits use blood pumps to remove blood from the access site, allowing the use of venous catheters. An example of an access site from a whale arter is fistula. Fistulas are surgically formed using implant material to connect an organ artery directly to a satellite. Fistula takes several months to ripen or be sufficiently generalize before they can be accessed for dialysis. Because they are under the skin, fistulas reduce the risk of bleeding or infection when long-term treatment is required. Filter patnets can be confirmed by listening with a stethoscope for bruit (formed by a rapid flow of blood despite this large circle) or by a tingling sensation known as a thrill. Never place a BP sleeve or tourniquet over a fistula as this can reduce the flow through the circuit and lead to clotting. In critical care, Ari Du Lumen is temporary. Catheters are the most common form of access. They can be quickly inserted next to the bed and used immediately. Perm catheters are lumen double-lumen catheters and arias designed for use in longer enjoys. They are used more frequently in patients with chronic kidney failure and may serve as a bridge until a fistula is surgically created and ready to use. Dialysis catheters are easy to distinguish from normal intra-rose lines by their red and blue focuses. The red lumen indicates the side of the valerie catheter used to exfy blood from the patient, and is referred to as an access lumen. The blue lumen is the site of repetation and is used to reinserate the patient's blood after it passes through the dialysis filter. If an adequate flow rate cannot be achieved by removing blood from the side of the catheter approach, the catheter's limbs can be reversed. Reversal of limbs produces a small reduction in classification due to re-aviation. Cautionary note: Double-lumen venous dialysis catheter can be used as a major venous infusion site during emergencies, however, to ensure the line remains patented for consecutive dialysis treatments, to reduce the risk of infection, it is better that these catheters are used for dialysis only. If this is the only access to blood vessels available in a life-threatening emergency, it can serve as a central line, however, always assume that the catheter contains heparin. When a dual lumen catheter is not used for dialysis, some form of anticoagulant is always rooted into each lumen to maintain patency. While citrate is the most common agent, some catheters are blocked with heparin or tPA. If heperin is used, the concentration may be as high as 5,000 - 10,000 units per word. Because each lumen contains a volume of ~1 to 2 ml, two lumens can contain a maximum of up to 40,000 units of heparin! Always assume that each lumen contains full strength heparin (even if it is marked as containing saline). Always withdraw at least 5 ml of blood from each lumen before using the catheter as an intravenous line. In CCTC, 4% citrate is used to block all dialysis catheters. Citrate binds to calcium to prevent clotting and does not affect aPTT, therefore, it is useful when clotting is plotted. Citrate is the standard for blocking all CRRT catheters in CCTC, even when Heparin has been used to maintain a filter patency. Although 4% citrate is the usual catheter blocking agent, heparin can still be used at the end of intermittent treatments or when lines are blocked by nephrology residents after entry. It is always safest to assume that heparin can be present in all dialysis catheters between treatments. 3. The principles of hemodialysis use the principles of diffusion, muelosis and convulsion, using an external filter to create an artificial nephron unit. Remember the normal unit of leron: blood flows from the renal artery (A) to an aperent artery (b). The aperent artery then enters Capsule (H) and becomes Glomerulus (C). Blood leaves the Glomerulus through Arteriole Efferent (D), which continues to be edited in fritol (e). Water and solutes filtered through the Glomerular membrane collect in bowman's capsule (H) and drain into a proximal tube (I). Filtering continues through the loop of Hennell (J), Distel Tubule (K), and Tubule (L) collection. Water and solutes are soaked from the seine into perittering gills, while solutes can also be excreted from the blood and pecked into a tube system for elimination in the final urine. The diagram above describes one nephron unit. Each kidney has about one million of these microscopic units. They maintain water, electrolyte, waste and acid base balance together. Arterial blood flows from the renal artery, branching out into smaller divisions known as arteries. The arterial branches eventually carry blood into small containers called Bowman's capsules, located in the cerebral cortex of the kidney. The artery that reaches Bowman's capsule is called an aphrenic artery. The blood flows into a special capillary (located inside bowman's capsule), called GLOMERULUS. Any blood left at the end of glomerulus comes out of Bowman's capsule through the aperent artery. The mighty artery is larger in diameter than the mea smaller artery. This arrangement provides a high rate of blood flow into glomerulus, but a high level of resistance to blood flows out of glomerulus. This structural difference produces hydrostatic pressure within glomerulus that is double that of other disabled people in the body. This increased hydrostatic pressure forces more water to move from glomerulus, across a semi-permeable glomerular membrane into Bowman's capsule. A particle that are small enough to pass through a spherical membrane will disperse an area of high concentration (from glomerulus) to a low concentration (to Bowman's capsule). When large amounts of water are forced across the membrane, additioanl particles (or solutes) are dragged along with the water. Thus, the great movement of water across glomerulus removes even more solutes than diffusion alone would remove. Washing of extra solutes across the membrane by a large flood of water is known as convection. Poteins are larger molecules and are too large to fit across normal spherical membranes. As a result, blood that leaves the glomerulus through efferent arteriole has most of the water and electrolyte removed, but all remaining plasma proteins. Therefore, blood in the operatic artery has higher oncotic pressure. In order to properly eliminate all waste products produced every day, we must filter very large amounts of water across glomerulus. Approximately 1200 ml per minute of filtering is produced. Until enough water was transferred through the membrane to wash away all Waste products, over-removal of water, glucose, electrolytes and other substances occurred. As a result, large amounts of filtered water and slutes will have to be re-soaked from tube fluid into the blood. Solutes and water are re-soaked into capillaries that are wrapped around tubes, called capriulate caps. These capt capillaries are a continuation of the operatic arteries. They're also responsible for the kidney's cessation. In addition to water cartilage and solot from a pipe filter solut, excess solutes can be excreted from peritubular gills into a filtration tube for elimination in the urine. 4. Artificial kidneys Dialysis filter is called artificial kidney. Blood was pulled from the patient and carried into the filter. Once inside, the blood moves through many tiny tubes called hollow fibers. Water and solutes can pass over a semi-permeable membrane between the blood and fluid surrounding the hollow fibers. Any liquid or liquid that enters the filter container will be emptied as waste. Schematic dialysis filter (artificial kidney) Note how the dialysis filter has a structural similarity to the nephron unit. Blood reaches the filter through the access tubes (apert artery). Blood enters the small hollow fibers within the filter (glomerulus). Water and solutes are scattered across the semi-ingrown membrane of the hollow fibers and collect the container (Bowman's capsule). Collected liquid (filtration or effluent) is then removed through drainage pipes (pipe collection). Blood left in the hollow fibers is returned to the patient through the repeating side of the filter (indifferent arteries). Although there are similarities between the nephron unit and the artificial canine, the artificial can have limited abilities. In the nephron unit, filtered water and debris enter the proximal crest. Because the nephroneoid is significantly removing more water and glands from necessity, most of the water and electrolyte entering the pipeline system is re-scanned. Unlike the nephron unit, the artificial kidney cannot re-absorb water or solutes enter the filter container and any filter that enters the filter container will be removed using the drainage pipe. As a result, one of the differences in the artificial renal is the absence of a proximal tube, a loop of the Hennell and Distal tube in which water and water reuptake and secretion occurs. Therefore, the drain pipe that comes out of the filter resembles a nephron unit collection tube, not a proximal tube. To compensate for the inability to re-absorb water and solutes after removal from the blood, the artificial kidney is manipulated to limit actual removal to just excess water and waste. This is done by adjusting dialysis solutions and overfiltering rate. If more water or solutes are removed from necessity, it may be necessary to return them through intra-thyroid transfuses. Artificial Does not replace other important kidney functions, including stimulation of red blood cell production (erythropoietin), blood pressure regulating sodium (renin) and calcium absorption by the digestive system (vitamin D synthesis). Hephron usually traps and recycles bicarbonat to maintain acid base balance. Bikarkarev is given to patients during hemodialysis to compensate for bickereckerboom deficits. The principles used during hemodialysis are tested below: 5. DIFFUSION diffusion is the movement of particles (solutes) across a semi-permeable membrane. Diffusion is the f movement from the side with the highest concentration of particles, alongside with the lowest concentration. 6. Dialysis fluid (DIALYSATE): Dialysis is the liquid pumped into the filter container, which surrounds the hollow fibers. The concentration of fluids in dialysis fluid determines diffusion gradients. The removal of excess solutes from the blood is achieved by dialysis fluid containing a lower solute concentration than the serum concentration (e.g. dialysis does not contain urea or creatinine). To maintain normal serum electrolyte levels, dialysis fluid contains sodium, chloride and magnesium levels equal to serum concentrations (thus, removing these electrolytes should only occur if the blood level exceeds normal serum concentrations). Kidney failure and potassium is often high at the beginning of treatment, so, we may start dialysis with a low concentration of potassium in dialysis. Because potassium is easily removed during dialysis, and ongoing dialysis will be required to ensure removal of other wastes such as urea and creatinine, potassium concentrations in dialysis often require upward adjustment as the level of potassium in the blood falls. Although in theory, potassium levels should not drop below 4 mmol/L in serum if dialysis contains 4 mmol/L, a number of factors that affect potassium serum levels in critical care. Insulin therapy and the use of sympathetic drugs promotes the movement of potassium from the blood into the cells. It can lower serum levels. In addition, loss of potassium through the digestive tract can increase the potential for hypokalemia. Low magnesium levels also suppress potassium serum levels, therefore, magnesium deficits should be replaced as needed. In addition, high hemofiltration rates can lead to additional potassium classification. Potassium levels must be closely monitored and adjusted to maintain normal serum concentrations. Kidney failure, serum bicarbonate levels are generally low, therefore, a source of bicarbonate is added to dialysis to relieve diffusion of bicarbonate into the blood. Lactate-based formulas provide one source (for example, Gambro LG formulas). Higher concentrations of lecat in dialysis promote diffusion into the blood. If liver function is normal, the catat is quickly converted into a liver bicarbonate. Prism (TM) and Prismaflex(TM) are users Bags of sterile dialysis. Lactate-based get-ready has long stability, making them less expensive to prepare. Since the bacerbont is only stable for a short period of time in the solution, it must be added to the dialysis bags before use. If the patient is unable to convert the catat into a bicarbonate at a fast enough rate, serum cabin levels will rise. This happens in both hepatic inefficiencies and shock conditions were the patient already has excess catate production due to anaerobic metabolism. In these cases, a bicarbonette containing a product is used to provide bicarbonette (e.g. B.O or Normocarb). If 1 L of dialysis is given per hour, one L of dialysis fluid will be collected in a drain collection bag per hour. It will be in addition to any liquid removed; Dialysis usually doesn't cross into the bloodstream. Concentration transitions play a major role in diffusion. These will be further examined in the confirmation hearing. The second factor affecting diffusion is the type of filter used. Diffusion of solutes cannot occur across a concentration color transition if the pores size is too small to allow passage. 7. ULTRAFILTRATION Ultrafiltration is the movement of water over semi-permeable membranes because of pressure color transition (hydrostatic, osmotic or ancoetic). The increased blood pressure in glomerulus creates positive driving pressure to force water across the globe's crust. Blood pressure inside the hollow fibers is positive, while the pressure outside the hollow fibers is lower. Increased negativity can be created outside the hollow fibers by pumping the wastewater by increasing the rate of fluid removal, or by increasing the rate of alternative flow. The difference between blood pressure in the hollow fibers and the surrounding pressure is TransMembrane pressure (TMP). The TMP determines ultrafilter production. Different filter membrane properties can produce different ultrafilter rates in fixed TMP. A more water-permeable filter will allow more water to cross the membrane at a given TMP. A filter with high water penetration is called a high flux membrane. 8. HEMOFILTRATION in hemodialysis circles, pulling large amounts of water across a semi-permeable membrane creates a withering current that drags additional solutes. While diffusion is effective in removing most small molecules, the convection improves the removal of small and medium-sized molecules. Therefore, convection can be added to the treatment of hemodyliza to improve solute removal. To prevent hypovalemia, return all removed water during the commotion to the blood before reaching the patient. It's called a replacement fluid. The hustle and bustle rates of 1 L/hr mean that one liter of fluid is removed from the patient's blood and eliminated in the drainage fluid and 1 L of alternative fluid is returned to the circuit before it reaches the patient. We set overfiltering rates by adjusting replacement rates. Liquids removed during the hustle and bustle are given back to maintain a net neutral fluid balance. Replacement fluid must be sterile intra-vehic fluids with concentrations of electrolytes similar to plasma. For example, if CRRT treatment includes a hustle rate of 1 L per hour, and fluid removal is set to 200 ml per hour, 1,200 ml will be pulled out of the patient and placed in the drain collection bag at any time. Because 1 L of hemofiltration is replaced, the removed network fluid is 200 ml. Whether the dose is used or not, the removed network fluid equals the definition of fluid removal. 9. Predilution vs. HEMOFILTRATION replacement fluids after digestion can be returned either before or post filter. You will be called predilution or post dilution kits. Early weakness means the replacement solution is returned to the blood before it reaches the filter, thinning the blood in the hollow fibres. After the beginning means that the replacement fluid is returned to the blood after the filter (but before the returning side of the access catheter). Pre-thinning thins the blood in the filter, reducing clotting. After the update centers the blood in the filter, improving the classification. 10. Creatinine elimination is a byproduct of muscle protein metabolism that is completely filtered by glomerulus and 100% eliminated. None of the filtered creatinine is re-needed from the tubes nor is any additional creatinine secreted into a post-glomerulus tubular lumen. That makes it the best indicator of kidney failure. Because it is completely eliminated during normal kidney function, measurement of creatine release is the best measure of glomeral filtration. Urea is another byproduct of protein metabolism, however, it is a byproduct of any protein metabolism (not just muscle protein metabolism). It's filtered into the squirt filter. Unlike creatinine, a filtered urea percentage is re-refused from the pipes. As a result, urea levels can be increased in the presence of normal creatine level. For example, urea can increase due to increased urea production (e.g., anabolic or catabolic conditions) or increased absorption of urea (e.g., due to dehydration). Creatinine only increases when kidney filtration decreases, or the production of creatinine becomes so high that it exceeds glomeral filtration capabilities. Excessive creatinine production can occur when significant muscle death has occurred, e.g. rhabdomyolysis. The classification is the rate at which the soles are cleaned from the body. The classification is abbreviated with the letter

K. The classification (or K) of solute is the volume of blood from which the substance is completely removed for each unit time (Gambro training manual). It is calculated as follows: K = secretion rate of solute/ blood concentration of solute to translate this into dialysis: if dialysis has the ability to clean 170 ml/min of urea at a blood flow rate of 200 ml/min, it means that for every 200 ml of blood that Using the filter, 170 ml will be returned without urea. The remaining 30 ml will have the same concentration of urea as the blood enters the filter. 200 ml of blood returned every minute to the systemic circuit will be much less urea than without dialysis, but will still have to mingle with system volume. Therefore, the blood must flow continuously through the filter before the overall systemic level begins to drop. You can use the following formula to calculate salt's classification in ml/min dialysis membrane. To calculate the rate of classification of solute, the following formula can be used, where Q(blood)B is the blood flow into the filter, Q(blood)out is the blood flow from the filter, C(blood)B is the concentration of loneliness in the prefilter serum and C(blood) is the concentration of blood solute in post filter blood. Q(blood)B and Q(blood)out are the same and equal to the blood flow rate. 11. It may be simpler: Example below: At a blood flow rate of 150 ml/min, with a pre-filter creatine of .980 and a post filter concentration of .343, creatine release by the filter is 97.5 ml/min. That's assuming there's no use of the Miw molse. Membrane dialysis filters should be effective at clearing waste, but must also be biologically compatible with human blood. Compatibility means that exposure of blood to the dialysis membrane produces minimal side effects. Filtration diligence is influenced by the size of pores, the number of pores and the thickness of the membrane. Typically, high flux membranes which have more or more large pores allow solutes and ultrafitrate to move across the membrane. A thinner membrane offers less resistance to solute movement by reducing the distance solute must travel across the membrane and also favors increased filtration. Solutes pass through the membrane according to solute size. Imagine taking a flour sieve and filling it with a mixture of sand, small rocks and debris. Shake the contents will make the smallest particles move towards the bottom, passing through the openings easily. Particles will be filtered through according to increasing size until you are left with large particles to fit through the sieve. Dialysis membranes act in the same way, allowing small and medium-sized molecules to pass across the membrane, without the loss of larger proteins. A high flux membrane that has a larger pore size increase classification by allowing larger molecules to pass through the membrane, and by allowing more ultrafiltrate flow. The standard AN69 filter used with CRRT is high flux membranes. Sinebing properties of membrane describe the lilies of membrane solutes during ultra-filtration. Seeps of solutes decrease as the molecular size increases. The cutting point of the membrane is defined by the molecular weight at which only 10% of solute is filtered. The surface area of the membrane determines the available area for diffusion The internal volume of the dialysis filter should be small enough to limit the amount of blood that is outside the blood vessel cell at any given time. This volume is important if the filter clots can be returned to the patient. Finally, absorption is the ability of larger solutes to adhere to the surface of the dialysis membrane. AN69 filters used in CRRT have strong adzorative properties. Absorption of medium-sized molecules including inflammatory mediators has been shown by a decrease in serum concentrations after initiation of a new filter. The greatest benefit occurs in the first few hours; Once filtration becomes saturated with protein, further removal from the serum is limited. While these proteins are too large to pass through the filter and remove the filter, removes the cytokines from the blood by allowing it to collect (like a sponge) in the filter. TMP is the pressure exerted on the dialysis membrane during surgery and reflects the difference between blood cells and fluids. TMP over +350 mmHg will propro a consultation alarm. TMP Alarm > 450 will produce excessive TMP alarm. The amount of increase and rate of increase TMP contribute to a filter alarm is clotting. Decreased filter pressure is another indicator of clotting. It's a sign of pressures in the filter's hollow fibers. This will rise slowly with filter use as hollow fibres fill up with a microscopic blood clot. The amount and rate of increase determines the activation of the filter is a clotting alarm. 12. DIFFUSION small molecular weight solutes are easily removed by diffusion (dialysis). The higher the gradual concentration, the higher the 2010 rate. Solutes will pass over a semi-removable membrane up to two solute concentrations to be equal. When dialysis fluid switches to dialysis fluid, the dialysis concentration of the fluid increases, reducing the color transition of diffusion. Once the concentration of dialysis of loneliness becomes equal to the concentration of blood, diffusion stops. To maintain a high diffusion gradient, keep the difference between blood concentrations and dialysis. Classification can be increased by higher dialysis or blood flow rates. Increasing dialysis maintains a low concentration of fluids on the dialysis side by increasing their removal from dialysis fluid. Increasing blood flow rate brings more solutes to the filter, promoting continuous diffusion. The smaller the molecule, the greater the classification by dialysis/blood flow. Although higher blood flow rates will increase the rate of classification, CRRT circuits have limitations. The smaller filter size (compared to hemodialysis circles) limits blood flow rates. Blood flow can be significantly increased with hemodyliza, however, blood flow rate adjustments are limited with CRRT. While increased dialysis flow rates improve the classification of small molecules, a medium-sized molecule Depends more on the size of the filter pores. The only way to increase the classification of medium-sized molecules is to add convection (hemofiltration). Optimal release is produced when dialysis flow rates are about double that of blood flow rates. CRRT blood flow rates are usually 150 ml/min. Dialysis flow rate of 1 L per hour provides dialysis flow of 16 ml/min. Increasing dialysis flow will have a greater impact than any increase in blood flow rates with CRRT. Dialysis flows against the current, or in the opposite direction to the blood flow. This promotes continued approval by ensuring adequate diffusion gradient is maintained. Dialysis fluid is shown at the repeating end of the filter, where the serum concentration of solutes began to fall (due to removal from the blood inside the filter). Dialysis fluid flows towards the access end of the filter where the fluid drainage pipes are located. Diffusion of solutes along the filter makes the highest concentration of waste in dialysis at the end of the filter approach. At the end of the approach, the blood concentration of loneliness is highest, balancing against the rising concentration of dialysis. HEMOFILTRATION dialysis effectively removes small (e.g. electrolytes) and small to moderate molecular weight solutes (e.g. glucose, urea, creatinine). Pore size limits the ability to disperse medium-sized molecules. One way to increase the classification of all small and large molecules is to draw large amounts of water across the semi-infused membrane, dragging more solutes by convection. Higher hustle and bustle rates are of interest to critical care. Higher pre-dilution rates may be a successful alternative to anticoagulant therapy, though, and research is needed to examine this possibility. There is also interest in the potential classification of medium-sized molecular weight including inflammatory intermediaries. In a European experiment, the hustle and bustle rates of 35 ml/kg per hour were associated with the best survival rates. Although higher dosage rates have been used in CCTC, our current practice uses predilution treatments. In this trial by Ronco, post dilution was used. The significance of the high rates of commotion through pre-forfeiture replacement is unknown. While increased ultra-filtration rates during the hustle and bustle help remove molecules that are too large to travel by diffusion, hemofiltration can also lead to the over-removal of small molecules. As a result, electrolyte removal can be increased beyond that produced by switching color to diffusion alone (for example, although the dialysis concentration of sodium equals normal serum levels, sodium levels can fall with high exmotation rates). Alternatively, high infusion rates of alternative fluids containing NaCl 0.9 can lead to hypernatrology. It can also increase chloride levels leading to hyperchloremic permelation (chloride and bicarbonate are both negatively charged and increased chloride levels can Decrease in bicarbonate to maintain anionic balance). When the hustle and bustle rates are high, careful monitoring is required to maintain normal electrolyte balance. Alternative fluids may need to be adjusted to keep serum levels in range. Alternatively, intermittent electrolyte bolognies may be required. The original continuous hemodialysis circular THERAPIES required arteries for venous access sites because they did not use a blood pump to draw blood through the filter. As a result, they were called CAV circuitry (arterial and vectic sequential). Today's technology uses a blood flow pump, so the most continuous circuits are CVV (continuous rote). SCUF (Ultra Slow Continuous Filtration): SCUF is removing water from the patient's blood as it travels through the filter. Water removal is known as ultrafiltering. SCUF is a treatment designed only to remove excess water. The amount of water removed is not enough to remove debris. CVVH (continuous rose thrombage) CVVH is the removal of large amounts of water across the filter membrane for waste removal. When large amounts of water are washed across the membrane, solutes are dragged along with the water (convection). Hemofiltration is the removal of water above and beyond the excess water removed during ultra-filtration. To prevent hypovalemia, water must be returned during the commotion before the blood is returned to the patient. This substitute is called substitution. CVVH is the use of an alternative liquid without dialysis fluid, plus or minus fluid removal. CVVHD (hemodialysis and continuous fair): CVVHD is the infusion of dialysis fluid into the dialysis fluid filter container (dialysis) surrounding the full-blood filter segments. Solutes that are small enough to fit through the membrane of the dialysis filter will pass an area of high concentration to low concentration (diffusion). Dialysis determines the glands that will be removed. If we want to remove solutes, the concentration in dialysis is lower than the blood concentration. If we want to give something to the patient, the concentration on dialysis is higher than the blood. CVVHD is the removal of waste by diffusion only, without the use of hemophilia (alternative fluid). It can be given with or without removing fluids from the patient. CVVHDF (Semo Semo Ryapia): CVVHDF is the use of dialysis and anthem. Treatment will include the use of dialysis fluids and replacement, and can be provided with or without removing fluids from the patient. Return to top references: Gambro Manual Training 1 and 2 Slides from Gambro Training Package, Reproduced with Permission Last updated: April 28, 2006 Last review: July 2, 2013, January 30, 2015, November 6, 2018 2018