

Elevating Dialysis Care: A Comprehensive Approach at Eskag Sanjeevani Hospital

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I. Introduction

Dialysis is a crucial treatment option for patients whose kidneys cannot filter their blood properly. Dialysis uses special equipment to remove excess water, waste products, and toxins from the body. This helps maintain the bodily balance, called homeostasis. Dialysis is vital for those with sudden kidney problems (acute kidney injury or AKI) or those experiencing a gradual loss of kidney function (chronic kidney disease or CKD, previously known as end-stage renal disease or ESRD). In 2010, around 2.5 million people worldwide received long-term dialysis. The need for dialysis depends on various factors such as how many patients have conditions that lead to ESRD, how early CKD is detected, and efforts to slow its progression. It is important for those at risk of ESRD and their caregivers to get thorough physical and psychological education. They should also learn about treatment options for the future. Being prepared helps prevent dialysis-related issues such as problems with catheters or fistulas, which can lead to serious complications including catheter-site infections, blood clots, bleeding, and a higher risk of death. Dialysis patients, especially in younger age groups, face significantly elevated mortality rates, mainly due to cardiovascular (40%) and infectious causes (10%). The increased cardiovascular risk in these patients can be attributed to factors such as chronic inflammation, substantial alterations in extracellular volume, dystrophic vascular calcification, and changes in cardiovascular dynamics during dialysis. However, At Eskag Sanjeevani hospital, (Kolkata, West Bengal) dialysis patients relish remarkably prolonged and healthy lives, exceeding ten years receiving more than thousands of dialysis. This exceptional outcome is facilitated by comprehensive support, including psychological education, telemedicine services, and regular nephrology consultations. The significantly lower costs, approximately one-third that of other private hospitals in West Bengal, make extended dialysis treatment accessible to patients and their families.

Apparatus used in hemodialysis:

Hemodialysis involves complex apparatus, including the blood and dialysis solution circuits connected by a dialyzer. The blood circuit uses a roller pump to move blood through the dialyzer and includes various safety features such as pressure monitors and air detectors. The dialysis solution circuit consists of a water purification system and controls for temperature and solution concentration. Water quality is closely regulated to ensure safety.

Dialysis machines used in Eskag Sanjeevani hospital uses both a central system, where one apparatus supplies dialysis solutions to multiple machines, and an individual system, where each machine prepares its solutions. Precise monitoring and adjustment of temperature, concentration, and fluid removal provides patient safety and effectiveness. Bicarbonate-buffered dialysate is used in this hospital; it contains a few or negligible acetate concentrates. Online monitoring helps maintain stable conditions, and high-dialysate calcium can benefit certain patients in whom the chances of hypercalcemia is low.

Ultrafiltration technique:

Ultrafiltration in haemodialysis involves the use of a semipermeable membrane to selectively filter molecules based on size and concentration gradients. A haemodialysis machine is used, consisting of a dialyzer or artificial kidney, which contains the semipermeable membrane. Blood from the patient's body is circulated through the dialyzer. The semipermeable membrane has microscopic pores that allow the passage of water and small molecules but prevent larger substances such as blood cells and proteins from passing through. Pressure differentials are created on either side of the membrane. The blood side typically experiences higher pressure due to a pump, while the dialysate (a fluid with a composition similar to plasma) side is at lower pressure. As blood passes through the semipermeable membrane, small molecules such as urea, creatinine, and excess

electrolytes move from the blood (high concentration) to the dialysate (low concentration) through the membrane. Larger components like red blood cells and proteins are too large to pass through the membrane and are retained in the bloodstream. Ultrafiltration also helps remove excess fluid from the blood, addressing issues of fluid retention common in kidney failure. The process is carefully monitored, and parameters such as flow rates, pressure differentials, and dialysate composition are adjusted as needed. Through the ultrafiltration process, hemodialysis helps maintain a balance of electrolytes, remove waste products, and manage fluid levels in the patient's body. Ultrafiltration in dialysis offers superior features that make it a valuable and patient-friendly tool for managing fluid balance and improving cardiovascular stability in individuals with kidney dysfunction. Its precision, comfort, and adaptability contribute to better outcomes and a more positive dialysis experience for patients. In Eskag Sanjeevani hospital, the superior features of ultrafiltration technique used in dialysis patients offer safety and effectiveness to the patients. The hospital offers ultrafiltration techniques to allow for precise and controlled removal of excess fluid from the patient's bloodstream. This precision helps prevent fluid overload, a common problem in individuals with kidney dysfunction, and contributes to better management of the patient's fluid balance. By preventing sudden and excessive fluid shifts, ultrafiltration promotes cardiovascular stability. It reduces the risk of complications such as fluid overload-related hypertension, congestive heart failure, and pulmonary oedema, making it a valuable tool in managing patients with heart and kidney issues. Traditional haemodialysis often leads to episodes of intradialytic hypotension, which can be uncomfortable and even dangerous for patients. Ultrafiltration in Eskag Sanjeevani hospital helps mitigate this risk by allowing gradual and continuous fluid removal, reducing the occurrence of low blood pressure during treatment. Patients often find ultrafiltration more comfortable and tolerable compared to traditional hemodialysis, as it avoids the rapid and large-volume fluid shifts that can cause symptoms like dizziness, cramps, and nausea. Ultrafiltration in this hospital is tailored to the specific needs of each patient, allowing healthcare providers to adjust the rate of fluid removal based on individual factors such as blood pressure, heart function, and overall health status. By preventing rapid changes in blood volume, ultrafiltration eases the workload on the heart, reducing the risk of cardiac strain during dialysis. This is especially beneficial for patients with heart conditions. This ultrafiltration minimizes the risk of complications associated with traditional dialysis, such as cramping, nausea, and hypotension, which can lead to treatment interruptions and discomfort. It renders improved long-term outcomes with the cardiovascular and fluid balance benefits leading to better long-term outcomes for patients with end-stage renal disease, contributing to improved quality of life and overall health.

Electrolyte balance:

During dialysis, especially hemodialysis, maintaining electrolyte balance is crucial as the process involves the removal of waste products and excess fluids from the blood. Electrolytes are essential minerals with electric charge, including sodium, potassium, calcium, and phosphate. Before each dialysis session, the patient's electrolyte levels are assessed through blood tests. This helps in understanding the existing imbalances and guides the dialysis prescription. The dialysate is a solution with a composition similar to plasma but without waste products. Its electrolyte concentrations are carefully adjusted based on the patient's needs and the prescription. Eskag Sanjeevani Hospital excels in the management of electrolyte balance during dialysis, offering a combination of personalized care, cutting-edge technology, skilled professionals, and a commitment to safety. These superior features underscore the dedication of the hospital to providing the best possible care for patients with renal concerns, making it a top choice for those seeking high-quality dialysis services. Eskag Sanjeevani Hospital prioritizes personalized care. Their approach to dialysis is patient-centric, focusing on individual electrolyte needs. This customized care ensures that patients receive treatments tailored to their specific requirements, resulting in improved electrolyte balance management. The hospital employs the latest dialysis equipment and technology, which allows for precise control over electrolyte concentrations during dialysis sessions. This modern infrastructure ensures that patients receive the highest standard of care, optimizing their electrolyte balance. Eskag Sanjeevani Hospital boasts a team of highly skilled nephrologists and healthcare professionals with extensive expertise in managing electrolyte imbalances. Their knowledge and experience enable them to address complex cases and provide effective solutions for patients. The patients receive nephrologist visits at regular intervals (twice a month) outside their dialysis sittings. The commitment of the hospital to patient well-being is evident in their continuous monitoring of electrolyte levels during dialysis. This vigilant oversight helps prevent sudden fluctuations and ensures that patients' electrolyte balance remains stable throughout the treatment. Eskag Sanjeevani Hospital employs advanced technology for real-time monitoring of electrolyte levels. This proactive approach allows for immediate adjustments during dialysis to maintain optimal electrolyte balance, reducing the risk of complications.

Dialyser wash:

Dialyzer washing, also known as reprocessing or rinsing, is a crucial step in the maintenance and reuse of hemodialysis dialyzers. After each hemodialysis session, the dialyzer may retain small amounts of blood, dialysate, and other substances. Washing helps remove these residuals, ensuring that the next dialysis session starts with a clean and uncontaminated dialyzer. Blood components, such as platelets, can adhere to the dialyzer membrane. Washing helps prevent clot formation, preserving the dialyzer's patency and ensuring uninterrupted blood flow during treatment. Eskag Sanjeevani Hospital stands out for its exceptional approach to dialyzer wash, a critical aspect of dialysis care. The hospital's commitment to providing superior dialyzer wash services is evident through several key features that set it apart in the field of renal care. Eskag Sanjeevani Hospital adheres to stringent sterilization protocols, ensuring that all dialyzers are thoroughly cleaned and disinfected before each use. This commitment to hygiene reduces the risk of infection and contamination during dialysis, safeguarding patient health. The hospital employs state-of-the-art dialyzer reprocessing equipment and technology, allowing for efficient and thorough cleaning. Advanced systems ensure that dialyzers are meticulously cleaned and sanitized, meeting the highest standards of quality. The hospital's dedicated technical team is highly trained in the proper handling and maintenance of dialyzers. Their expertise ensures that each dialyzer receives a meticulous wash, eliminating the risk of cross-contamination and promoting patient safety. Eskag Sanjeevani Hospital maintains a rigorous quality assurance program to monitor the effectiveness of dialyzer wash procedures continually. Thorough dialyzer wash procedures at Eskag Sanjeevani Hospital minimize the risk of complications related to dialysis, such as infection or contamination. By upholding strict sterilization and quality standards, the hospital creates a safe environment for patients, ensuring that their dialysis experience is as risk-free as possible. Eskag Sanjeevani Hospital's efficient dialyzer wash processes help manage costs (approximately one-third compared to other private hospitals in West Bengal), making dialysis services more accessible to a wider range of patients. This cost-effectiveness benefits individuals seeking high-quality care without straining their financial resources.

Total Dissolved Solids (TDS) control in dialysis:

Controlling Total Dissolved Solids (TDS) in dialysis is crucial to ensure the safety and efficacy of the hemodialysis process. TDS refers to the total amount of inorganic and organic substances dissolved in water, including minerals, salts, and other impurities. The quality of water used in dialysis is of utmost importance. Dialysis facilities utilize water treatment systems to purify water and control TDS. Reverse osmosis (RO) and deionization (DI) are common components of water treatment systems that effectively reduce TDS levels. Routine testing of water quality is essential to monitor TDS levels. This includes testing for conductivity, which is a direct measure of the concentration of dissolved ions in the water. Eskag Sanjeevani Hospital places great emphasis on Total Dissolved Solids (TDS) control in dialysis, recognizing its pivotal importance in renal care. The commitment of the hospital to managing TDS effectively is underscored by several key factors that set it apart in the realm of dialysis. The hospital maintains a state-of-the-art water purification system, meeting the stringent standards defined by the Advancement of Medical Instrumentation (AAMI). This commitment to water purity ensures that TDS levels in the dialysis solution remain within safe limits (< 5 mg/L), safeguarding patients from potential harm. Eskag Sanjeevani Hospital employs advanced filtration technology to remove impurities and maintain optimal TDS levels in the dialysis solution. This cutting-edge approach contributes to a safer and more effective dialysis process. The hospital's efficient TDS control practices help manage costs (approximately one-third compared to other private hospitals in West Bengal), making dialysis services more accessible to a wider range of patients. This cost-effectiveness benefits individuals seeking high-quality care without straining their financial resources.

II. Discussion

Eskag Sanjeevani Hospital adopts a comprehensive approach to dialysis, recognizing the multifaceted needs of patients. By providing psychological education, telemedicine services, and regular nephrology consultations, the hospital goes beyond traditional care, contributing to the remarkable longevity and well-being of dialysis patients. The hospital employs sophisticated apparatus in hemodialysis, incorporating safety features and precise controls. The use of both central and individual systems for dialysis solutions, along with meticulous monitoring, reflects a commitment to patient safety and effectiveness. Bicarbonate-buffered dialysate and online monitoring further enhance the quality of care. The discussion highlights the superior features of ultrafiltration in Eskag Sanjeevani Hospital. The precise and controlled removal of excess fluid contributes to cardiovascular stability, reducing the risk of complications associated with fluid shifts. Tailoring ultrafiltration to individual patient needs enhances comfort and outcomes, emphasizing the hospital's patient-centric approach. Eskag Sanjeevani Hospital excels in managing electrolyte balance during dialysis through personalized care, advanced technology, and a skilled healthcare team. The hospital's commitment to continuous monitoring, immediate adjustments, and real-time electrolyte level tracking ensures optimal electrolyte balance, minimizing the risk of complications. The hospital's approach to dialyzer washing is characterized by stringent

sterilization protocols, state-of-the-art equipment, and a dedicated technical team. Thorough dialyser wash procedures contribute to infection prevention, patient safety, and cost-effectiveness, making high-quality dialysis accessible to a broader patient population. Eskag Sanjeevani Hospital places significant emphasis on TDS control in dialysis, aligning with AAMI standards. The hospital's commitment to water purity, advanced filtration technology, and efficient TDS control practices contribute to the safety and cost-effectiveness of dialysis services.

III. Conclusion

Eskag Sanjeevani Hospital emerges as a beacon of excellence in renal care, particularly in the field of dialysis. The hospital's holistic approach, advanced technology, and unwavering commitment to patient safety are evident across various aspects of dialysis care. From psychological education to ultrafiltration techniques, electrolyte balance management, dialyser wash protocols, and TDS control, the hospital prioritizes quality, safety, and cost-effectiveness. The exceptional outcomes, with patients experiencing prolonged and healthy lives, showcase the success of Eskag Sanjeevani Hospital's approach. By addressing not only the physical aspects of dialysis but also the psychological and individualized needs of patients, the hospital sets a standard for comprehensive and compassionate renal care. The hospital's focus on accessibility through cost-effective practices demonstrates a commitment to serving a diverse patient population. Eskag Sanjeevani Hospital stands as a model for healthcare institutions seeking to provide state-of-the-art dialysis services while prioritizing patient well-being and inclusivity.