What is renal failure?

The kidney is a very important organ, and cannot be restored to health once it fails. However, it is possible to avoid or retard the deterioration of its functionality if therapy is started at an early stage.

The kidney has the following functions:

- **Regulation of bodily fluids**: Keeps the amount of bodily fluids stable by the regulating the amount of urine

- **Excretion of waste**: Excretes the body’s waste through urine

- **Regulation of the concentration of electrolytes**: Controls the concentration of electrolytes such as sodium, potassium, calcium, magnesium, and phosphate.

- **Regulation of the acid-base balance**: Keeps the pH of the blood within the proper range

- **Activation of vitamin D**: Regulates the concentration of calcium and phosphorus by activating vitamin D

- **Secretion of erythropoietin**: Encourages the production of erythrocyte by secreting erythropoietin

The deterioration of the kidney’s functions can cause conditions including anemia, hypertension, hyperphosphatemia, hyperkalemia, hypocalcemia, and a decrease in the amount of urine production.

As renal failure progresses, hemodialysis, peritoneal dialysis, or renal transplantation are the only three treatment options. It is important to understand the advantages and disadvantages of these three treatments before making a decision.
Hemodialysis is a method of achieving the extracorporeal removal of bodily waste and excess water from the blood, as well as regulating electrolytes. Blood is pumped to and from the body through a vein and processed in a dialyzer, which is an artificial kidney. The process is completed after a set amount of time passes, depending on the patient, and a predetermined amount of water is removed from the body.
Renal replacement therapy options

Peritoneal dialysis

Peritoneal dialysis is a method of purifying the blood by filtering waste and excess water into dialysis fluid in the peritoneal cavity, as well as regulating electrolytes. This daily treatment is considered similar to the way the kidneys work. Before the peritoneal dialysis can begin, a simple operation to insert a catheter into the peritoneum is necessary. Depending on the remaining renal functionality, peritoneal dialysis may be used concurrently with Hemodialysis.
Renal replacement therapy options

Transplantation

A renal transplant is the only treatment available for patients with terminal renal failure. This treatment recovers the functions of the renal system by transplanting a kidney from a donor.

The advantages of transplant include relief from dialysis, dialysis related complications, and dietary restrictions, also resulting in safer pregnancies and deliveries.

The primary disadvantage is a possibility the following problems may occur after a transplant:

- Deterioration of the transplanted kidney could result in the need for dialysis treatment again.
- The patient will need to take immunosuppressive medicines to avoid rejection of the kidney.
- Taking immunosuppressive medicines can result in numerous side effects.
Methods for supplying dialysis fluid

In hospitals, there are two methods of supplying dialysis fluid to a patients’ bedside.

(1) Central Dialysis Fluid Delivery System (CDDS)

This system involves dry dialysate being dissolved in water that has been purified by a Reverse Osmosis Filtration Device. The solution is then diluted to the appropriate concentrations in the Multiple-Patient Dialysis Fluid Delivery System. It is then administered by a Dialysis Machine. This is the most common method in Japan.

(2) Individual Dialysis Fluid Delivery System

Purified water is piped directly to the dialysis room, to be used by individual dialysis machines to produce dialysis fluid at each patient’s bedside. This is the most common method used around the world.

In this method, the concentrated liquids in bottles used to produce the dialysis fluid have to be set near the dialysis machine (usually the patients’ bedside). These bottles are heavy, and cause problems in terms of transportation and storage. Using a powder that is lighter, occupies less space, and is only dissolved just before dialysis is preferable.