Dialysis Treatment for Kidney Disease

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Abstract – Dialysis treatment is an imperfect substitute, at best, for normal kidney function. For the better part of the last century this technology has developed into one of the world’s foremost lifesaving technologies. However, this treatment is only as good as it’s effectiveness in mimicking renal function.

Today, over 20 million people in the US face some form of kidney disease or failure. Of these, only a small margin will receive transplants from donors. In cases of transplant rejection, or intermediate phases where transplant is not required, dialysis is used to complement or replace renal function. In the past 70 years since its conception, dialysis has struggles with the complete replication of kidney function. Even today hemodialysis systems cannot replicate the homeostatic conditions in the body as perfectly as the real thing, especially when it comes to specific hormone release. Diagnosing renal disease is fairly easy and accurate. In most cases hypertension or diabetes will damage the filtering mechanisms in the kidneys causing increased levels of proteins and blood in urine samples. However, mortality rates in patients with dialysis are quite staggering. Cardiovascular disease, sepsis and peritonitis are the three leading causes of death among dialysis patients worldwide.

There have been many upgrades in the past half century that have allowed those with kidney disease to go from a few more months of life to sustaining life and even providing a margin of quality to an ailment with no cure. At one point the size of a dialysis machine would occupy a large portion of a room. The prototype, a hemodialysis machine occupies no more space than a breadbox. The real advantage, though, comes from innovations in filtering mechanisms. Over the years, scientists after all, include such as convection dialysis and ultrafiltration have substantially increased the efficiency of the filtering process.

With the increased efficiency of dialysis machines and dialyzers came several changes for patients as well. The portability of smaller machines and easier use through automation has allowed many patients to take treatment into their own hands. This has added a quality of life to patients who had very little life or freedom of movement left. Also, as it turns out, some of the earliest decisions in choosing who was qualified for this particular treatment led to the founding of what is now known as a bioethics committee. Furthermore, engineering innovation in both dialysis machine and dialyzer has cut down the need for laborious filtering treatments.

As stated previously, this technology is not without its flaws. For successful dialysis treatments access sites must be created. These sites are very fragile and susceptible to infection and leakage. In most cases peritoneal dialysis is preferred to hemodialysis for its ease of use and portability. One must simply attach a dialysate bag to the dialysis catheter, infuse the abdominal cavity with the dialysate, let it sit and then drain. However, this is an all day process. Hemodialysis comes with less portability, but also less chance of infection. In any dialysis treatment the process is limited because dialysis only filters waste and excess fluid from the blood. It does now introduce the hormones provided by a kidney which provide red blood cell production stimulus, calcium absorption and blood pressure regulation. Finally, the wastes generated by these filtration systems pose an economic problem. More than 10 liters of waste per person are created a day through dialysis with no real way to recycle or purify the fluid. All in all, this treatment is a far more complex system than just a filtration unit.

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