Hemodialysis is one option for renal replacement therapy in people with End Stage Renal Disease (ESRD). It is required when a person’s kidneys are unable to complete their normal function, that of maintaining the normal intracellular and extracellular fluid environment within the body. It entails removing excess fluid, as well as wastes such as urea, while replacing necessary substances such as bicarbonate. In this article, we present some of the barriers surrounding the implementation of dialysis for patients and explore how some of these barriers were overcome.

EARLY DEVELOPMENT AND IMPLEMENTATION OF HEMODIALYSIS

The first successful use of hemodialysis occurred in the Netherlands in 1945 by Dr Willem J. Kolff with a machine dubbed the “artificial kidney.” A 67-year-old woman suffering from acute kidney injury was nearly anuric, but with 11.5 hours of dialysis, her blood urea nitrogen and serum potassium levels dropped and she eventually made a full recovery. Dialysis, still experimental then, was reserved, as in this case, for failures of conventional treatment. Interestingly, a Canadian surgeon, Dr. Gordon Murray, also invented a hemodialysis machine around the same time as Dr. Kolff. In 1946, he successfully dialyzed a woman in a uremic coma at Toronto General Hospital. Despite these successes, hemodialysis was initially met with concern from physicians regarding safety and efficacy, especially since treatment course was determined largely by trial-and-error and few people were trained to operate the machine. However, throughout the 1950’s, hemodialysis gained popularity and improvements and modifications were made to facilitate treatment and improve outcomes. It was indicated primarily for patients with acute kidney injury who only needed to be dialyzed temporarily rather than for ESRD as it was difficult to maintain vascular access for repeated dialysis to take place. This problem was resolved in 1960 when Dr. Belding H. Scribner and colleagues introduced an arteriovenous shunt, which kept the radial artery and forearm vein in the arm of the patient connected using Teflon tubing. This shunt remained on the patient to maintain vascular access, facilitating connection with the hemodialyzer whenever dialysis was needed.

ONCE HEMODIALYSIS BECAME AVAILABLE TO THOSE WITH ESRD, WHO RECEIVED CARE?

The Scribner shunt made hemodialysis a viable option for ESRD. In 1962, Dr. Scribner opened the world’s first outpatient dialysis centre in Seattle. The Seattle Artificial Kidney Centre consisted of only three sets of dialysis equipment with limited staff. Thus, the centre formed two committees to determine which patients were best suited for hemodialysis. The first consisted of nephrologists who ensured patients met stringent medical criteria. The second, the Admissions and Policy Committee, consisted of two physicians, a Christian minister, lawyer, housewife, businessman, and labour leader. It was also nicknamed “the God committee” as its role was to assess the “relative worth” of a candidate to their family and to society at large and chose which patients would survive and which would die from their disease. Choices were allowed to be guided by each member’s conscience and patients could be evaluated on marital status, occupation, income, education, emotional stability, future potential, gender, and age. Successful candidates were usually those who were hard-working, had many children, were actively involved in church and community affairs, but had few monetary savings such that if they died, the state would have to support the family. As a result, the decisions of the Committee were largely biased towards White, Protestant, middle-class men. Committee members agonized over these difficult decisions and critics felt that determining “social worth” was unethical and suggested that decision-making be based on a method that does not permit the comparison of social worth among individuals, such as choosing by lottery. Fortunately, such committees became unnecessary as hemodialysis became more widely available. In 1972, U.S. Congress agreed to provide dialysis in end-stage renal disease for those who could not afford it.

The initial situation in Canada is not unlike that in the United States. Prior to the implementation of the 1966 Medical Care Act, regular dialysis treatments were only offered in a few hospitals due to prohibitive costs. Again, the question of who would receive treatment and how such allocations would be determined posed a dilemma for physicians and policy-makers. Selection committees regulated who received dialysis, based on criteria such as age, the stage of renal disease, absence of other comorbidities, and suitability for kidney transplantation. It was the death of a young man from kidney disease in Montreal that precipitated the creation of the charitable Kidney Foundation of Canada in 1964, dedicated to advocacy, research, and support for Canadians with renal disease. Eventually, under Medicare, the cost of dialysis was fully covered, allowing patients with renal disease access to previously unattainable life-saving care. Advocacy for hemodialysis has saved many lives. In 2009, 22,310 Canadians with ESRD were being treated with dialysis. Although it is known that renal transplantation is the best treatment for ESRD, the number of kidneys available for transplant is not increasing as sharply as diagnoses of ESRD and demand for hemodialysis is expected to increase in the future.

DEVELOPMENT OF HOME DIALYSIS

Even with improved access, hemodialysis, although life-saving, is very time-consuming, invasive, and may negatively impact quality of life. One aspect of initial treatment was that most patients needed to travel to a hospital and dedicate several hours a week to being dialyzed. A method that circumvents this necessity, promoted in Canada by Dr. Robert Ul dall and Dr. Andreas Pierratos at the University of Toronto in 1993, is home hemodialysis. This method allows patients to perform dialysis at
home during sleep for most, if not all, nights of the week. Although patients must be trained, home dialysis has been associated with improved quality of life and a higher cost utility compared to traditional in-center hemodialysis. While home dialysis peaked in 1993 at 37.4% of all dialysis in Canada, in 2011 that figure was only 23–24% in Ontario. Home dialysis can be difficult to implement and unsuitable for some patients, but it offers an alternative for patients who would prefer to be treated at home.

EXPRESSION OF DIALYSIS TO RURAL SITES

Canada is a vast country and many communities are isolated from large hospital centres containing dialysis units. Many patients are faced with a shortage of dialysis stations in their area and have a limited ability to select their preferred location or schedule for dialysis. Patients living in rural areas may need to make hours-long drives to the nearest hospital, a heavy burden in vulnerable populations such as the elderly and disabled. A delivery model proven to be safe and effective in Ontario is the satellite model, in which rural satellite sites are paired with a larger centre or “hub” to ensure that while patients may receive hemodialysis in a rural setting, they are still granted access to an experienced nephrology team. An example of a satellite dialysis unit can be found in Goderich, Ontario, a town of 8,000 residents about an hour north of London, Ontario. Opening in 2001 as a satellite of the London Health Sciences Centre Renal Program, the facility can accommodate 12 patients per day who would otherwise need to travel to London for hemodialysis. A nephrologist from London visits approximately once a month for patient assessment and adjustment of medications and conference calls are made to discuss patient care on a weekly basis. Although such facilities are primarily for the most stable patients requiring dialysis, they have empowered smaller communities and helped alleviate some of the added difficulties of having ESRD in a rural setting.

CONCLUSIONS

Access to hemodialysis has improved over the years and patients are now empowered with more options for treatment, including home dialysis and access to satellite sites. However, accessibility to treatment remains an issue for chronic kidney disease and ESRD patients. As the prevalence of kidney disease has increased, so has demand for dialysis, from more than 5,900 Canadians on dialysis in 1990 to 22,300 in 2009, an increase from 53% to 59% of all ESRD patients. Furthermore, for many patients, transplantation remains the ultimate goal of treatment. It is known that renal transplantation is generally more effective at treating many patients, transplantation remains the ultimate goal of treatment. It is known that renal transplantation is generally more effective at treating many patients, transplantation remains the ultimate goal of treatment. It is known that renal transplantation is generally more effective at treating many patients, transplantation remains the ultimate goal of treatment. It is known that renal transplantation is generally more effective at treating many patients, transplantation remains the ultimate goal of treatment.

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