# Belding Scribner, Seattle to Melbourne and the benefits of enthusiasm, teamwork and collaboration

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**Abstract:**

This paper is an account of the early development of dialysis and highlights what can be achieved when people with enquiring minds and clear objectives, work together as a team and collaborate with those in other disciplines to solve problems. It has dealt with developments in dialysis in Seattle espousing its example of teamwork, enthusiasm and commitment, Scribner's open mindedness and breadth of vision and his unsolicited assistance. Early developments in Melbourne's nephrology history are described.

**Key Words**

history, kidney, renal, dialysis, transplant, scribner

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## Introduction

In the Clinical Research Unit of the Walter and Eliza Hall Institute - a ward of the Royal Melbourne Hospital, Ian Wood and Ian McKay were dedicated and enthusiastic about their special interests, equally enthusiastic about other ideas presented to them and not afraid of a spirited and critical discussion. Their enthusiasm was infectious, stimulating and encouraging. These virtues have characterised many of the people I have been associated with over the years and have created an interesting, supportive and challenging environment. In his book on the value of gastric biopsy, a technique which Wood developed, was a quotation from McFarlane Burnet - "new knowledge follows closely in the wake of a new technique". This proved to be true in the 1960s when new dialysis techniques became available and contributed greatly to the understanding and management of chronic kidney failure.

## Seattle 1960 - 1967

Belding Scribner was Professor and Head of the Department of Nephrology, University of Washington, Seattle. He developed with Quinton, a teflon-silastic arteriovenous shunt which enabled repeated access for haemodialysis thus simplifying the procedure and making it applicable to the treatment of chronic renal failure. He was single minded and enthusiastic about his own work, interested in the ideas of others and keen to collaborate. He had remarkable success in that four of the first five patients with chronic renal failure he accepted for dialysis lived for 10 years or more. By prolonging the life of patients with chronic renal failure, he also opened up a major new area for study.

Scribner's department attracted a large group of young physicians from home and abroad and was a hive of activity. He pursued his interest in haemodialysis techniques and collaborated with the University of Washington Department of Engineering in optimising dialysis efficiency and studying dialysis kinetics. Related areas of research were assigned to different groups. S.T. Boen was invited from Amsterdam to pursue his interest in peritoneal dialysis and with Tenckhoff, to develop and extend the technique and improve peritoneal access. A laboratory was set up for this purpose and for the manufacture of bulk peritoneal dialysate. Blagg developed dialysis outside hospital - in a dialysis centre and in the home. Curtis and Sherrard studied renal bone disease, Hickman applied dialysis techniques in children and Eschbach's long collaboration with the Department of Haematology in Seattle led eventually to the use of Erythropoietin in dialysis patients.

New ideas were welcome. Despite the success of the arteriovenous shunt Scribner was quick to recognise the advantages of the A-V fistula, to adopt it and set about solving the monitoring required for its safe use in an unsupervised situation. Within six years it was in common use and soon became the access of choice, although not without its problems. Scribner also invited Charles Willock to demonstrate his Drake Willock dialysis machine which allowed on-line manufacture of dialysate and seeing the value of a fixed proportioning system, adapted it for on line manufacture of peritoneal dialysis fluid. Peritoneal access was also improved and peritoneal dialysis was developed as an alternative to haemodialysis for patients with chronic renal failure. It was surprisingly successful despite its low clearance of urea and other small molecules and Tenckhoff demonstrated improvement in nerve conduction times in patients on long-term automated peritoneal dialysis. This led to the development of the "middle molecule hypothesis", the idea that there may be an unidentified molecule, larger than urea that was responsible for some of the manifestations of uraemia, such as peripheral neuropathy.

Despite considerable effort, the elusive middle molecule was never identified and is more concept than reality. But the theory highlighted the fact that molecules of different size, charge, structure and

**Author:**

Dr John K Dawborn retired

distribution required different dialysis conditions for efficient removal and led to recognition of the importance of small amounts of residual renal function in maintaining patient well being. Scribner initially chose a large area, low resistance Kiil system to allow low blood flow, pumpless dialysis with very little monitoring. Dialysate chloride concentration was measured using a simple bedside test, the dialysate was tested after dialysis commenced for traces of blood. Inflow and outflow pressures were monitored in the extracorporeal circuit. More extensive safety features were introduced later. The long, low-flow dialysis with a one square metre surface area dialyser may have played a large part in the good early results achieved. Patient well-being was also improved when the frequency of dialysis was increased from once to twice and then three times week.

Following the introduction of the fistula, with increased blood flow rates and more extensive and reliable safety monitoring, dialysis times were reduced in some units based on achieving comparable urea clearances, often with less satisfactory results. Comparison of different dialysis regimes led to the "square metre-hour hypothesis" and emphasised the importance of surface area and time on dialysis as well as blood and dialysate flow for achieving optimal results. Current trends have returned to longer, more frequent dialysis resulting in improved well being, better diet and better biochemical control. In retrospect we were led astray by the glamour of the new technology, cost pressures and the natural desire of most patients to spend as little time as possible on dialysis.

## Competing interests and scarcity of resources.

The improvements in dialysis were also important to cadaveric renal transplant programmes, allowing time for planning and matching, expansion of waiting lists and an alternative treatment in the event of transplant failure. Resources were limited and transplantation was generally seen to be the better treatment option, providing more complete rehabilitation if successful. Scribner saw dialysis as a viable long term treatment for chronic renal failure which should be readily available. However resources were limited and his ideas were not generally accepted. His enthusiasm, the desire to make dialysis more available and lack of funds led to the development of better safety monitoring, reuse procedures and unsupervised dialysis. There was plenty of discussion of the many ideas and problems that arose. Among these there were the ethical problems of selecting those patients who would benefit from dialysis and for whom funding and resources were available. These decisions could not really be made on medical suitability or need as genuine demand exceeded the availability of treatment and the responsibility of refusing treatment was onerous. My impression was that committees set up to make these decisions on ethical grounds were equally devisive and unsuccessful and one such "independent" committee set up in Seattle was short lived. Later when funding was restricted at the Austin Hospital, my attempt to pass the responsibility for patient selection on to an ethics committee was also unsuccessful.

## Developments in Melbourne

Improved access provided by an arteriovenous shunt greatly simplified the dialysis procedure and it was soon widely adopted. Scribner had many requests for traineeships from within the United States and other countries which resulted in improved dialysis facilities and related research at home and abroad. When I left Melbourne in 1962 haemodialysis was available at the Alfred Hospital for the treatment of acute renal failure through the University of Melbourne, Department of Surgery (Marshall and Ewing) following its introduction at Sydney Hospital in 1958 (see article in this issue by John Stewart).

When I returned home in 1967, successful dialysis and transplant units had developed in Sydney, Melbourne and Adelaide. Dialysis was primarily used as an adjunct to renal transplantation and funding for these programmes was limited. I was fortunate to get a temporary appointment to the Royal Melbourne Hospital programme (Mathew, Marshall and Kincaid Smith) as a junior physician – a great learning experience. Largely because of the limited resources, there was hesitation in accepting patients if they were not suitable for renal transplantation and a reluctance to establish new units.

Not long after my return I was contacted by Scribner to say he wanted to send a patient home to Australia to start home dialysis. Peter Morris was from Sydney and with his brother had set up a successful importing business soon after leaving school. They had sold the business in order to travel. Peter was sailing with a wealthy American businessman when he developed end stage renal failure and was admitted to the Seattle unit. He was keen to return home and his friend offered to purchase a Drake Willock haemodialysis machine for him. Peter and his machine duly turned up at the Royal Melbourne Hospital for home training.

Sue Evans was working as a dialysis technician in the Royal Melbourne Hospital renal unit at the time and was nominated to familiarise herself with the new equipment, develop a training schedule and teach Peter how to manage his dialysis, to clean, store, reuse and test his Kiil dialyser, maintain his equipment and deal with common problems. Motivation and independence were essential and fortunately Peter had plenty of both; he was determined to be home for Christmas – eight weeks away. He was transferred to the care of John Stewart at Sydney Hospital just before Christmas 1967. Later Peter was instrumental in persuading the Lions Club to provide dialysis machines to patients who would undertake home dialysis.

Meanwhile I had moved to the Austin Hospital. Not surprisingly there was little enthusiasm for starting another renal unit or a home dialysis programme. Resources were limited and home dialysis was not fully accepted by either politicians or the nephrology establishment. As well as being a relatively new and unproven technique it would require resources that were needed elsewhere. Scribner had faced similar

problems and on hearing of our difficulties sent a superseded Sweden Freezer tank dialysis machine and Kiil dialyser on permanent loan to the Austin from Seattle. Once we were able to dialyse patients at the Austin, the ice was broken. Austin Doyle and Frank O'Rourke supported our efforts to start home dialysis on a shoestring budget. Rather inadequate salaries were found to employ Sue Evans and later Ray McGregor, a surgical instrument maker from the United Kingdom. Both were lateral thinkers and problem solvers. A cheap bulk, gravity feed fluid delivery system and second hand pressure monitor was used by the first home dialysis patients in Melbourne, using an insulated tank and wooden stand made by the hospital carpenters. The patients had to adjust the water temperature from the hot and cold taps, add the dialysate, stir with a paddle and test the chloride concentration of the dialysate with Scribner's bedside chloride test.

Later, a more sophisticated insulated tank system was developed and used until superseded by the newer but more expensive automated fluid supply systems. An automated closed peritoneal dialysis system was also developed and used in the hospital and home. Training and technical staff provided an on call service for problems with dialysis at home or in hospital – essential backup, particularly for patients who were prepared to take responsibility for their own treatment. Of course there were also failures. Neither the locally built Kiil dialyser nor the bulk peritoneal fluid supply worked satisfactorily and were discarded. Fortunately both staff and patients accepted that problems would occur and were usually part of the solution.

The problems faced at the Austin in the early days were similar to those faced by other units throughout Australia and by Scribner. We were fortunate to benefit from his experience, enthusiasm and generosity. In the 1960s the diagnosis and treatment of renal disease was an exciting new area of medicine and attracted people interested in new techniques. Once dialysis was accepted as a viable long term treatment for end stage renal failure, supported by the Lions Club throughout Australia and subsequently by government, renal units expanded, new units were established and back-up for renal transplantation was improved. Unfortunately the limited availability of donor kidneys and the large numbers of older people with kidney failure meant that expansion of dialysis was required and demanded considerable human and financial resources. Home dialysis developed largely because it was less expensive and required less hospital space than in-centre hospital dialysis. It also shifted much of the responsibility for treatment to the patient and the patient's family. Many returned to work and appreciated their independence from the hospital. However, while dialysis at home can be advantageous for the patient, it is also a burden for the family, particularly if medical complications develop.

In the 1970s home dialysis was necessary to allow most patients who warranted dialysis to be treated. Nearly 70% of dialysis patients in Seattle were dialysing at home. In other states the figure was 20-30%. When limited care dialysis developed, the cost advantage of home dialysis virtually disappeared and many patients preferred the limited care option. Later continuous ambulatory peritoneal dialysis (CAPD) took over as the cheaper and simpler option for those who wanted their independence and for those who could not be funded for one of the other treatment options. Home haemodialysis now accounts for only 2-5% of patients on maintenance dialysis and is mostly indicated in those for who choose it or who live in a remote area without supervised dialysis facilities. I believe it should be up to the patient to choose if they wish to dialyse at home and other alternatives should be made available if dialysis at home becomes less suitable on medical grounds or disruptive to the family.

My purpose in writing has been to give some account of the early development of dialysis and to point out what can be achieved when people with an open and enquiring mind and a clear objective work together as a team and collaborate with those in other disciplines to solve problems. I acknowledge the many people in Australia and overseas, who have contributed to the expansion and development of nephrology in general, and dialysis and renal transplantation in particular. It would be difficult to name all those who have participated in this process even at the Austin Hospital, let alone in other hospitals and research units in Australia. I recognise the major contribution of nursing and technical staff to the development and dissemination of dialysis and the great and enduring support they have provided to the ever tolerant patient.

I have largely dealt with developments in dialysis in Seattle because of its historical interest, its example of teamwork, enthusiasm and commitment, Scribner's open mindedness and breadth of vision and his unsolicited assistance. There will undoubtedly be many gaps and inaccuracies in my recollections. I hope that those who were involved at one level or another can fill in those gaps, relive and reminisce about old times, enjoy their memories and recognise the importance of their contributions.