

Home haemodialysis in Spain

Alejandro Pérez-Alba¹, Guillermina Barril-Cuadrado², Inés Castellano-Cerviño³,
Guillermo Martín-Reyes⁴, Cristina Pérez-Melón⁵, Fernanda Slon-Roblero⁶,
M. Auxiliadora Bajo-Rubio⁷

¹ Servicio de Nefrología. Hospital General de Castellón (Spain); ² Servicio de Nefrología. Hospital Universitario La Princesa. Madrid (Spain); ³ Servicio de Nefrología. Hospital San Pedro de Alcántara. Cáceres (Spain); ⁴ Servicio de Nefrología. Hospital Regional Universitario de Málaga (Spain); ⁵ Servicio de Nefrología. Complejo Hospitalario de Ourense (Spain); ⁶ Servicio de Nefrología. Hospital de Navarra. Pamplona (Spain); ⁷ Servicio de Nefrología. Hospital Universitario La Paz. Madrid (Spain)

Nefrologia 2015;35(1):1-5

doi:10.3265/Nefrologia.pre2014.Oct.12751

The history of home haemodialysis (HHD) is the history of haemodialysis (HD) itself. In the nineteen-fifties and the start of the nineteen-sixties, the artificial kidney technique successfully used for the first time at the end of World War II by Dr Kolff was perfected and with the advent of the autologous fistula reported by Cimino and Brescia, the first HD programmes could be created as treatment for advanced chronic kidney disease (CKD). Due to the unavailability of adequate hospital facilities and with the idea of treating as many patients as possible, these programmes brought HD to the home. As such, HHD saved many lives in this first stage, with the programmes led by Shaldon in London, Merrill in Boston and Scribner in Seattle being notable. Subsequently, HHD continued to grow and reached its peak at the start of the nineteen-seventies at which point 40% of US patients used this method. From this period onwards, we have witnessed a progressive decline for different reasons, amongst which we must highlight the increase in the number and morbidity and mortality of patients, the development of peripheral HD units and changes in the financing policy. Furthermore, at the end of the nineteen-seventies and the beginning of the nineteen-eighties, peritoneal dialysis (PD) was developed, a new dialysis method that simplified the technique and also allowed it to be performed at home.

HHD began a gradual decline until the mid-nineteen-nineties, in which there was renewed interest due to the limitations observed in improving morbidity and mortality in kidney patients on conventional HD regimens of three sessions per week. New, more frequent and longer forms of HD had begun

to be explored with the aim of avoiding long interdialysis periods, and in order to make this more sustainable from the financial point of view, it was brought to patients' homes with more frequent dialysis being undertaken in hospital only when indicated by doctors in order to improve some comorbidities.

DEFINITION. CURRENT SITUATION

The term HHD includes the part of renal replacement therapy that refers to extracorporeal clearance carried out by the patients themselves in their own home. There are different regimens¹, including:

- Short daily dialysis (2.5-3 hours, 5-6 days a week).
- Frequent nocturnal dialysis (6-8 hours, 5-6 days a week).
- Conventional regimens (4 hours, 3 times a week or on alternate days).

In Spain, the rate of HHD is currently low, accounting for only 0.3% of the total dialysis patients (although the real figure is unknown, since there are no records in this regard). By contrast, the prevalence of the technique has always been high in Australia and New Zealand (9.1% and 19% respectively of total dialysis) with there being a progressive increase in Northern European countries such as Denmark (5.7%), Finland (53%), the Netherlands (2.7%), Sweden (3.4%) and the United Kingdom (4%), where there are great efforts to develop it. Canada should also be highlighted, with a prevalence of 3.9% and from which there has been a large quantity of scientific publications, and the United States (1.3%), with high growth since 2002 due to changes in the Medicare financing policy². Although the overall figures continue to be very low, recent growth has been very high and a greater development of the technique is expected over

Correspondence: M. Auxiliadora Bajo Rubio
Servicio de Nefrología. Hospital Universitario La Paz.
Paseo de la Castellana, 261. 28046, Madrid. (Spain).
mauxiliadora.bajo@salud.madrid.org

the coming years, with a progressive growth in the incidence and prevalence of patients²⁻⁴.

ADVANTAGES OF HOME DIALYSIS

The purpose of any renal replacement technique is to obtain the best morbidity and mortality rates with the best quality of life possible. HHD favours the prescription of more frequent HD, with the patient being administered an overall higher dose of dialysis with a lower cost than if this were to be carried out in a hospital, as well as avoiding unnecessary travel and long waiting times, with the inevitable benefits for their quality of life. Various studies have demonstrated many beneficial effects related to the increased frequency of HD, with the following being notable:

- Better control of uraemic toxins, with better tolerance in the sessions, eliminating the post-dialysis fatigue syndrome⁵⁻⁸.
- Better control of anaemia with a lower dose of erythropoiesis-stimulating agents^{5,6}.
- Better control of mineral and bone disorders associated with CKD with a lower dose of chelating agents⁷⁻⁹.
- Better control of nutritional parameters¹⁰⁻¹³.
- Better control of blood pressure with a lower dose of antihypertensive drugs, facilitating the control of dry weight and maintenance of residual renal function^{5,8,14,15}.
- Improvement in cardiological parameters such as a reduction of left ventricular hypertrophy^{5,8,14,15}.
- Improved quality of life parameters^{11,16,17}.
- Lower morbidity and mortality¹⁸⁻²².
- Reduced costs²³⁻²⁵.

In summary, increasing the frequency of HD makes it more physiological; and using it at the patients' homes allows them to adjust their pathology to their own lifestyle, avoiding travel. Distance is a factor that facilitates home techniques, but large urban areas are also eligible for obtaining the clinical benefits of these techniques, and therefore the degree of urbanisation is not a barrier²⁶⁻²⁸. There is no doubt that the home dialysis techniques that enhance self-care offer additional advantages to patients. It has been noted that the two existing techniques, HD and PD are not competing with each other; on the contrary, they enhance one another and where there is more HHD there is more PD, and vice versa.

Most studies that support the advantages of HHD are observational and there are currently no randomised prospective studies. As such, the National Institute of Diabetes and Digestive and Kidney Diseases developed the Frequent Hemodialysis Network, which is a follow-up study of Canadian and US patients over 12 months between March 2006 and May 2009, in which two patient groups were studied. In the first study, 245 patients treated with HD 3 times/week in the hospital (2.5-4 hours, with eKt/V greater than 1) were analysed versus 6 times/week in the hospital

(1.5-2.75 hours); and in the second, 87 patients treated with HD 3 times/week in the hospital (2.5-4 hours, with eKt/V greater than 1) were studied versus nocturnal HD at home 6 times/week (6-8 hours). In the first section of the study, after 12 months of treatment, a reduction in the left ventricular mass 16.3 ± 35.3 g ($p < .001$) was observed, as well as an improved Physical Health Composite Score of 3.3 ± 8.9 points ($p = .004$), better blood pressure control and better control of hyperphosphataemia in the daily HD group, in addition to the need for more interventions in vascular access in this group. The authors concluded that short daily HD is better than a conventional HD regimen⁸. In the second section of the study, after 12 months of treatment, the patients treated with nocturnal HD compared with HD three times per week did not show significant differences in the primary objectives that included death and reduction of the left ventricular mass, but they did show significant differences in the secondary objectives of blood pressure and hyperphosphataemia. In this instance, it was also necessary to increase the actions on vascular access in the nocturnal HD group. As such, the authors concluded that frequent nocturnal HD was not superior to the conventional regimen⁹. However, upon analysing this second section of the study, it was confirmed that only 33% of the statistical power was achieved since only 87 patients were randomised due to difficult recruitment, and as such, it was not easy to randomise nocturnal home against hospital (two radically different dialysis methods). Of these, only 78 completed the study, and therefore the statistical power was further reduced. There was also greater inequality in frequent nocturnal incident patients and 25% on the nocturnal regimen received fewer than 5 sessions of dialysis per week.

Given the problems in carrying out randomised studies, subsequent efforts have focussed on comparing large international cohorts. In this regard, the study by Nesrallah²² is notable, which compared French, Canadian and US patients during the period between 2000 and 2010 comparing data from the IQDR (International Quotidian Registry), which included 338 patients (treated 4.8 sessions/week, 7.4 hours/session) compared to 1388 patients of the DOPPS (Dialysis Outcomes and Practice Pattern Study) (treated 3 sessions/week, 3 hours/session). Mortality of 6.1% in the first group and 10.5% in the second group was observed (*hazard ratio* 0.55, confidence interval 0.34-0.87). The same working group, on this occasion led by Dr Suri³⁰, compared 318 IQDR patients in the hospital (5.8 sessions/week, 15.7 hours/week) with 575 DOPPS patients in the hospital (3 sessions/week, 11.9 hours/week). In this case there was higher mortality in the daily HD group. However, the authors themselves indicate that, despite the efforts made to eliminate confounding factors, other factors as important as residual renal function, the severity of the comorbidity and blood pressure were not assessed. Furthermore, data related to vascular access (more prosthetic fistulae in the daily HD group) were lost and the reason for transfer to an intensive regimen was not analysed.

INDICATIONS AND CONTRAINDICATIONS FOR HOME HAEMODIALYSIS

HHD is a technique that may be used by very diverse age groups from young patients with an active working life who would be able to improve their time management, to older patients with major comorbidities, for whom this technique could allow them to stay at home in the final stage of their life. As such, the liberalisation of medical criteria maintains the good clinical results of HHD³¹, further improving the quality of life of patients³². With this aim, the American group Medical Education Institute has developed the MATCH-D selection criteria for HHD patients, which in its 2013 version presents three groups of selection criteria that allow patients to be categorised into three different recommendation statuses for the technique.

We consider that in HHD, liberal and objective criteria must be used to select patients, providing information to all those who are not absolutely contraindicated and attempting to assess the elimination of potential barriers in order to perform the technique, when these exist. Table 1 displays the absolute and relative contraindications that currently must be taken into account when considering whether a patient is a candidate or not for HHD.

Vascular access must have characteristics that make its objectives easy to achieve, i.e. obtaining sufficient flow for HD. A native fistula is preferable to a prosthetic fistula and the latter is preferable to a permanent catheter³⁴. The presence of a temporary catheter would be a contraindication for this technique until permanent access is obtained. If it is impossible to cannulate the native fistula, this is not a contraindication for the technique. In this instance, if self-puncture is not possible, we should try to use techniques that facilitate it, such as the Buttonhole technique¹. If this is not possible, we

should assess the insertion of a permanent catheter, although in this case the patient must be made aware that the use of a central venous catheter increases the risk of infection and the associated morbidity and mortality^{35,36}.

SPANISH SOCIETY OF NEPHROLOGY HOME HAEMODIALYSIS GROUP

It may be that in Spain, given the low current use of HHD, in which there are few patients per hospital and they are far from one another, attempts must be made to join efforts and experiences in order to increase its use. The final objective of the group is to increase this technique in our country, being convinced that it can be very beneficial for a certain group of patients. As such, we are considering a series of short- and medium-term objectives that may help to achieve the final objective. These would be the following:

- Knowing the real HHD situation in Spain by creating a patient registry.
- Knowing the barriers that impede its development and promoting its use.
- Carrying out multicentre studies in the field of HHD.
- Creating scientific documentation of interest on HHD (reviews, guidelines, etc.).
- Promoting knowledge and sharing with patients and healthcare professionals the benefits related to its use, in order that HHD may be a real therapeutic option.
- Contacting other international societies that have promoted the development of this technique.

In this regard, on 30 June 2014, the Governing Board of the Spanish Society of Nephrology (S.E.N.), approved the creation of the working group. We face many challenges ahead that we will attempt to address, since we consider that we cannot continue with a minimum incidence in the

Table 1. Contraindications for home haemodialysis

Absolute contraindication:

- Homeless patient or patient without availability of electricity/water
- Patient with inadequate hygiene conditions (personal, home)
- Severe mental illnesses (psychosis/dementia) that make this technique impossible
- Patients with frequent or non-controlled seizures
- Patient awaiting a living donor transplantation

Relative contraindication:

- Sensory impairment (blindness, deafness, illiteracy)	Assess carer
- Impairment in handling activities	Assess carer
- Dubious hygienic conditions	Assess re-education
- Inadequate home characteristics (space, electricity, water)	Assess with technique
- Drug/alcohol abuse	Assess after rehabilitation
- Mental illnesses (not psychosis, not dementia)	Assess psychological/psychiatry care

technique without offering this method of treatment to our patients. HHD is a good dialysis technique with great advantages for the patient, which allows it to be used daily at a reduced cost and which is being implemented in other countries in our setting on a large scale. Although in Spain the rate of use is low, we believe that this working group can change the panorama over the coming years. We invite all members of the S.E.N. who are interested in this technique to participate in this group by contributing their ideas and experience.

Conflicts of interest

The authors declare the following potential conflicts of interest.

They receive fees for lectures.

REFERENCES

- Nesrallah GE, Mustafa RA, MacRae J, Pauly RP, Perkins DN, Gangji A, et al. Canadian Society of Nephrology guidelines for the management of patients with ESRD treated with intensive hemodialysis. *Am J Kidney Dis* 2013;62(1):187-98.
- Collins AJ, Foley RN, Chavers B, Gilbertson D, Herzog C, Ishani A, et al. US Renal Data System 2013 Annual Data Report. *Am J Kidney Dis* 2014;63(1 Suppl):A7.
- Mitra S, Brady M, O'Donoghue D. Resurgence in home haemodialysis: perspectives from UK. *Nephrol Dial Transplant Plus* 2001;4(Suppl 3):iii1-3.
- McGregor MS, Agar JW, Blagg CR. Home haemodialysis-international trends and variation. *Nephrol Dial Transplant* 2006;21:1934-45.
- Culleton BF, Walsh M, Klarenbach SW, Mortis G, Scott-Douglas N, Quinn RR, et al. Effect of frequent nocturnal hemodialysis vs conventional hemodialysis on left ventricular mass and quality of life: a randomized controlled trial. *JAMA* 2007;298(11):1291-9.
- Schwartz DI, Pierratos A, Richardson RM, Fenton SS, Chan CT. Impact of nocturnal home hemodialysis on anemia management in patients with end-stage renal disease. *Clin Nephrol* 2005;63(3):202-8.
- Ayus JC, Achinger SG, Mizani MR, Chertow GM, Furmaga W, Lee S, et al. Phosphorus balance and mineral metabolism with 3 h daily hemodialysis. *Kidney Int* 2007;71(4):336-42.
- Chertow GM, Levin NW, Beck GJ, Depner TA, Eggers PW, Gassman JJ, et al. In-center hemodialysis six times per week versus three times per week. *N Engl J Med* 2010;363(24):2287-300.
- Daugirdas JT, Chertow GM, Larive B, Pierratos A, Greene T, Ayus JC, et al. Effects of frequent hemodialysis on measures of CKD mineral and bone disorder. *J Am Soc Nephrol* 2012;23(4):727-38.
- Pierratos A, Ouwendyk M, Francoeur R, Vas S, Raj DS, Ecclestone AM, et al. Nocturnal hemodialysis: three-year experience [see comments]. *J Am Soc Nephrol* 1998;9(5):859-68.
- McPhatter LL, Lockridge RSJ, Albert J, Anderson H, Craft V, Jennings FM, et al. Nightly home hemodialysis: improvement in nutrition and quality of life. *Adv Ren Replace Ther* 1999;6(4):358-65.
- Galland R, Traeger J, Arkouche W, Cleaud C, Delawari E, Fouque D. Short daily hemodialysis rapidly improves nutritional status in hemodialysis patients. *Kidney Int* 2001;60(4):1555-60.
- Kaysen GA, Greene T, Larive B, Mehta RL, Lindsay RM, Depner TA, et al. The effect of frequent hemodialysis on nutrition and body composition: frequent Hemodialysis Network Trial. *Kidney Int* 2012;82(1):90-9.
- Chan CT, Floras JS, Miller JA, Richardson RM, Pierratos A. Regression of left ventricular hypertrophy after conversion to nocturnal hemodialysis. *Kidney Int* 2002;61[6]:2235-9.
- Fagugli RM, Reboldi G, Quintaliani G, Pasini P, Cio G, Cicconi B, et al. Short daily hemodialysis: blood pressure control and left ventricular mass reduction in hypertensive hemodialysis patients. *Am J Kidney Dis* 2001;38(2):371-6.
- Heidenheim AP, Muirhead N, Moist L, Lindsay RM. Patient quality of life on quotidian hemodialysis. *Am J Kidney Dis* 2003;42(1 Suppl):36-41.
- Finkelstein FO, Schiller B, Daoui R, Gehr TW, Kraus MA, Lea J, et al. At-home short daily hemodialysis improves the long-term health-related quality of life. *Kidney Int* 2012;82(5):561-9.
- Kjellstrand CM, Buoncristiani U, Ting G, Traeger J, Piccoli GB, Sibai-Galland R, et al. Short daily haemodialysis: survival in 415 patients treated for 1006 patient-years. *Nephrol Dial Transplant* 2008;23:3283-9.
- Pauly RP, Gill JS, Rose CL, Asad RA, Chery A, Pierratos A, et al. Survival among nocturnal home haemodialysis patients compared to kidney transplant recipients. *Nephrol Dial Transplant* 2009;24(9):2915-9.
- Johansen KL, Zhang R, Huang Y, Chen SC, Blagg CR, Goldfarb-Rumyantsev AS, et al. Survival and hospitalization among patients using nocturnal and short daily compared to conventional hemodialysis: a USRDS study. *Kidney Int* 2009;76(9):984-90.
- Kjellstrand C, Buoncristiani U, Ting G, Traeger J, Piccoli GB, Sibai-Galland R, et al. Survival with short-daily hemodialysis: Association of time, site, and dose of dialysis. *Hemodial Int* 2010;14(4):464-70.
- Nesrallah GE, Lindsay RM, Cuerden MS, Garg AX, Port F, Austin PC, et al. Intensive hemodialysis associates with improved survival compared with conventional hemodialysis. *J Am Soc Nephrol* 2012;23:696-705.
- McFarlane PA, Pierratos A, Redelmeier DA. Cost savings of home nocturnal versus conventional in-center hemodialysis. *Kidney Int* 2002;62(6):2216-22.
- McFarlane PA, Bayoumi AM, Pierratos A, Redelmeier DA. The quality of life and cost utility of home nocturnal and conventional in-center hemodialysis. *Kidney Int* 2003;64(3):1004-11.
- Komenda P, Gavaghan M, Garfield S, Poret A, Sood M. An economic assessment model for in-center, conventional home, and more frequent home hemodialysis. *Kidney Int* 2012;81:307-13.
- Agar J, Hawley C, Kerr G. Home hemodialysis in Australia and New Zealand: how and why it has been successful. *Semin Dial* 2011;24:658-63.
- Karthik K, Christopher T, Simon P. Intensive home haemodialysis: benefits and barriers. *Nat Rev Nephrol* 2012;8(9):515-22.
- Osterlund K, Mendelssohn D, Clase C, Guyatt G, Nesrallah G. Identification of facilitators and barriers to home dialysis selection by canadian adults with ESRD. *Semin Dial* 2014;27(2):160-72.

29. Rocco MV, Lockridge RS Jr, Beck GJ, Eggers PW, Gassman JJ, Greene T, et al. The effects of frequent nocturnal home hemodialysis: the Frequent Hemodialysis Network Nocturnal Trial. *Kidney Int* 2011;80:1080-91.
30. Suri RS, Lindsay RM, Bieber BA, Pisoni RL, Garg AX, Austin PC, et al. A multinational cohort study of in-center daily hemodialysis and patient survival. *Kidney Int* 2013;83:300-7.
31. Jayanti A, Nikam M, Eba L, Dutton G, Morris J, Mitra S. Technique survival in home haemodialysis: a composite success rate and its risk predictors in a prospective longitudinal cohort from tertiary renal network programme. *Nephrol Dial Transplant* 2013;28:2612-20.
32. Hall YN, Larive B, Painter P, Kaysen GA, Lindsay RM, Nissenson AR, et al. Effects of six versus three times per week hemodialysis on physical performance, health, and functioning: Frequent Hemodialysis Network (FHN) randomized trials. *Clin J Am Soc Nephrol* 2012;7(5):782-94.
33. MATCH.D GROUP. Method to assess treatment choices for home dialysis. Available at: <http://homedialysis.org/match-d>.
34. Rodríguez Hernández JA, González Parra E, Julián Gutiérrez JM, Segarra Medrano A, Almirante B, Martínez MT, et al.; Sociedad Española de Nefrología. Guías de acceso vascular en hemodiálisis. *Nefrología* 2005;25 Suppl 1:3-97.
35. Ocak G, Halbesma N, le Cessie S, Hoogeveen EK, van Dijk S, Kooman J, et al. Hemodialysis catheters increase mortality as compared to arteriovenous accesses especially in elderly patients. *Nephrol Dial Transplant* 2011;26(8):2611-7.
36. Feldman HI, Kobrin S, Wasserstein A. Hemodialysis vascular access morbidity. *J Am Soc Nephrol* 1996;7:523-35.