nefrología
Revista de la Sociedad Española de Nefrología
www.revistanefrologia.com

Original article

Characteristics and technical survival of home hemodialysis in the Valencian Community (1976–2020)

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ARTICLE INFO

Article history:
Received 25 April 2021
Accepted 10 August 2021
Available online 23 January 2023

Keywords:
Hemodialysis
Home hemodialysis
Technical survival
Registry

ABSTRACT

Introduction: Home hemodialysis (HDD) is implemented in the Valencian Community with a higher prevalence than to the rest of the national territory, with a prevalence of 13.4 patients pmp in December 2018. We carried out an assessment of the patients characteristics and the overall and technical survival in HDD depending on the historical moment of onset and its origin.

Material and methods: We conducted a retrospective and descriptive study including patients of the Valencian Registry of Renal Patients from the beginning of data reported until December 2020. We calculated overall survival (combined event death-technical failure, censoring transplantation) and technical survival (event technical failure, censoring exitus and transplantation). Comparing technical survival according to the starting era: ancient (1976−2000) vs modern (2001−2020) and according to the modality of origin. We performed univariate and multivariate Cox regression in the total series for both overall and technical survival.

Results: 236 patients on HDD (611.4 patient-years of follow-up), mean age 49.7 ± 16.3 years; median time of prior renal replacement therapy 0.2 years. The ratio of transplantation, death, and technical failure were 13.2, 4.4, and 7 events per 100 patient-years, respectively. In the comparison by ancient (n = 57) vs modern (n = 179) eras, age (37.5 vs 53.5 years), DM (3.5 vs 13.4%) and chronic tubuleinterstitial nephropathy (24.6 vs 8.9%) as a cause of chronic kidney disease were statistically significant. The probability of coming from outpatient consultation (33.3 vs 48.6%) and peritoneal dialysis (1.8 vs 12.8%) were higher in modern era with statistical significance. In the ancient era a single hospital centralized 57.9% of the patients, and in the modern era between two hospitals centralized 55.8% of the patients. Overall survival in the ancient era was 83.7% at 1 year, 77.4% at 2 years, and 61% at 5 years; and in the modern

DOI of original article:
https://doi.org/10.1016/j.nefro.2021.08.003.
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era 87.3% per year, 83% 2 years and 47.8% 5 years (Log Rank 0.521). Technical survival in the ancient era was 85.4% at 1 year, 79% 2 years, and 64.1% 5 years; and in the modern era 91.4% per year, 88.5% 2 years and 74.5% 5 years (Log Rank 0.195). There were no statistical differences in the comparison based on technical of provenance. In the Cox regression it was statistically significant for overall survival: the age and being diagnosed with heart disease, vascular disease or active neoplasia and for technical survival liver disease or social problem, both in univariate and multivariate.

Conclusions: In the modern era there is a considerable increase in HDD patients in the Valencian Community. There was a center effect in the development of HDD programs, most of the patients depended on few healthcare centers. The patients were older and had greater comorbidity in the modern era, despite this without affecting the technical and overall survival of the HDD.

Características y supervivencia técnica de la hemodiálisis domiciliaria en la Comunidad Valenciana (1976–2020)

Palabras clave:
Hemodiálisis
Hemodiálisis domiciliaria
Supervivencia técnica
Registro

RESUMEN

Introducción: La hemodiálisis (HD) domiciliaria (HDD) está especialmente implementada en la Comunidad Valenciana en comparación al resto del territorio nacional, con una prevalencia de 13,4 pacientes pmp a diciembre del 2018. Realizamos una valoración de las características de los pacientes y de la supervivencia global y técnica del paciente en HDD en función del momento histórico de inicio y de su procedencia.

Material y métodos: Pacientes incluidos en el Registro de Enfermos Renales de la Comunidad Valenciana desde que se reportan datos al mismo hasta diciembre del 2020. Estudio descriptivo y retrospectivo, calculando supervivencia global (evento combinado muerte-fallo técnico, censurando trasplante) y supervivencia técnica (evento fallo técnico, censurando muerte y trasplante). Comparamos la supervivencia de la técnica en función de era de inicio: antigua (1976−2000) vs moderna (2001−2020), y en función de la modalidad de procedencia. Realizamos regresión de Cox uni y multivariante en el total de la serie tanto para supervivencia global como técnica.

Resultados: 236 pacientes en HDD (611,4 pacientes-año de seguimiento), edad media 49,7 ± 16,3 años; tiempo terapia renal sustitutiva previa 0,2 años de mediana. Los ratios de trasplante, muerte y fallo técnico fueron 13,2; 4,4 y 7 eventos por 100 pacientes-año respectivamente. En la comparación por eras según inicio en HDD, antigua (n = 57) vs moderna (n = 179) fue estadísticamente significativo la edad (37,5 vs 53,5 años), la DM (3,5 vs 13,4%) y la nefropatía tubulointersiticial crónica (24,6 vs 8,9%) como causa de enfermedad renal crónica Hubo en la era moderna mayor probabilidad de provenir de consulta externa (33,3 vs 48,6%) y de diálisis peritoneal (1,8 vs 12,8%) con significación estadística. En era antigua un único hospital centralizaba el 57,9% de los pacientes, y en era moderna entre dos hospitales centralizaban el 55,8% de los pacientes. La supervivencia global en era antigua fue de 83,7% al año, 77,4% 2 años y 61% 5 años; y en era moderna 87,3% al año, 83% 2 años y 47,8% 5 años (Log Rank 0,521). La supervivencia técnica en era antigua fue 85,4% al año, 79% 2 años y 64,1% 5 años; y en era moderna 91,4% al año, 88,5% 2 años y 74,5% 5 años (Log Rank 0,195). No hubieron diferencias estadísticas en la comparación en función de la procedencia. En la regresión de Cox fue estadísticamente significativo para supervivencia global la edad y estar diagnosticado de cardiopatía, enfermedad vascular o neoplasia activa y para la supervivencia técnica hepatopatía o problema social, tanto en análisis uni como en multivariante.

Conclusión: En la era moderna existe un incremento considerable de pacientes en HDD en la Comunidad Valenciana. Existió un efecto centro en el desarrollo de los programas de HDD, la mayoría de los pacientes dependían de pocos centros asistenciales. Los pacientes fueron de mayor edad y mayor comorbilidad en la era moderna, pese a ello sin afectar ni la supervivencia técnica y ni global de la HDD.

Key concepts

- Data extracted from the Valencian Community Registry of Patients with Kidney Disease.
- Increase in home haemodialysis in the Valencian Community.
- Most of the patients are concentrated at a few nephrology clinics.
- There is an increase in age and morbidity rates in patients on home haemodialysis in the modern era.
- Technique and overall survival of patients on home haemodialysis are maintained in the modern era.

Introduction

There has been a considerable increase in the number of patients in home haemodialysis (HHD) in recent years, particularly in northern Europe, the United Kingdom, Canada and the United States, while it has remained high in Australia and New Zealand. At the end of 2018, according to the different national and international registries, HHD reached prevalences (of the total population on dialysis) of 8% in Finland, 7.1% in Denmark, 4.5% in the Netherlands, 4.7% in the United Kingdom, 3.1% in Sweden, 4.5% in Canada, 7.9% in Australia, 14.8% in New Zealand and 1.9% in the United States.[1–4] Worldwide, over 16,000 people were on HHD at that time.

We do not have specific and complete data on HHD for Spain but, from the European registry,[1] including data reported on 31 December 2018 from 15 of the 17 Spain's autonomous communities (La Rioja and the Balearic Islands were not reported), there were 195 patients on HHD, representing 0.5% of the total population on dialysis. There were variations between the different parts of Spain. Navarra, with 21.1 patients per million population (pmp), and the Valencian Community, with 13.4 pmp, had the highest rates of HHD, while areas with moderate rates included Galicia (7.7 pmp) and the Community of Madrid (6.4 pmp). In other areas, such as Cantabria, Castilla La Mancha and Catalonia, rates were below 1 pmp.

As a result of the significant growth in the use of HHD in the Valencian Community in recent years, we thought that it was of interest to report our experience. Using data from the Valencian Community Registry of Patients with Kidney Disease, we assessed the changed of characteristics of patients over time and whether there were differences in patients being able to remain on the technique according to when they started or their original form of renal replacement therapy (RRT).

Material and methods

We conducted a descriptive study of the characteristics of the patients in the HHD programme included in the Valencian Community Registry of Patients with Kidney Disease. The current structure of this registry was formalised following the Order of the Minister of Health and Consumer Affairs of 20 November 1991. It is a mixed registry of both hospital-based (public and private hospitals) and out-of-hospital (haemodialysis centres) patients, with continual updating that is mandatory for all centres in the Valencian Community (reporting inclusions, patients leaving the programme and changes in the type of renal replacement therapy or dependent centre). Communication between the reporting centre and the registry is established through a (now computerised) closed notification file.

We asked the Valencian Community Registry of Patients with Kidney Disease for a list of all the patients who at some point were known to be in the HHD programme, as they had data up to December 2020. The first patient was dated from April 1976. All together they reported 310 cases. After checking the cases to avoid duplications we identified 236 patients on HHD.

It was conducted a comparative analysis of the characteristics of the series according to the start date: old (from 1976 to 2000) and modern (from 2001 to 2020). The analysis was divided into these specific eras because it was in 2000 when the interest in HHD surfaced worldwide, with more frequent dialysis regimens and the gradual introduction of specific monitors for HHD.[5]

A second analysis was performed based on original procedure that the patients were started with: advanced chronic kidney disease clinic (ACKD), peritoneal dialysis (PD), in-centre HD (CHD) or kidney transplant. The objective was to study the present level of development of the integrated home dialysis model[6] (PD followed by HHD) and the influence of the ACKD units.

To make comparisons between starting time periods, we used Student's t-test for independent data in the case of quantitative variables when a normal distribution was followed, Mann–Whitney U for non-normal distribution and the chi-squared test for categorical variables. In the comparison according to origin, the Kruskal–Wallis test was used for continuous variables and the chi-squared test for categorical variables. In both cases, statistical significance was considered when $p < 0.05$. Kaplan–Meier survival curves were performed: overall (event: death and leaving the programme, censoring kidney transplant) and technique (event: leaving the programme, censoring transplant and death). The patient to tranfered PD or CHD was considered that he left the programme. Comparisons of overall and technique survival were made according to the starting period and according to the technique the patient was started. A Cox regression analysis was performed for overall and technique survival on the entire series with age and comorbidity reported in the Valencian Registry (DM, heart disease, vascular disease, chronic obstructive pulmonary disease, active cancer, systemic disease, liver disease, other disorders and social problem), using univariate and multivariate analysis. For all the statistical calculations, the statistical program SPSS Statistics version 24 was used.

Results

A total of 236 patients were identified, 611.4 patient-years of follow-up (median 659 days/patient, interquartile range (IQR) 316–1,230). The number of incident cases per year over time are shown in Fig. 1. In the series as a whole, the mean age when starting HHD was 49.7 ± 16.3 years, with a time on RRT prior

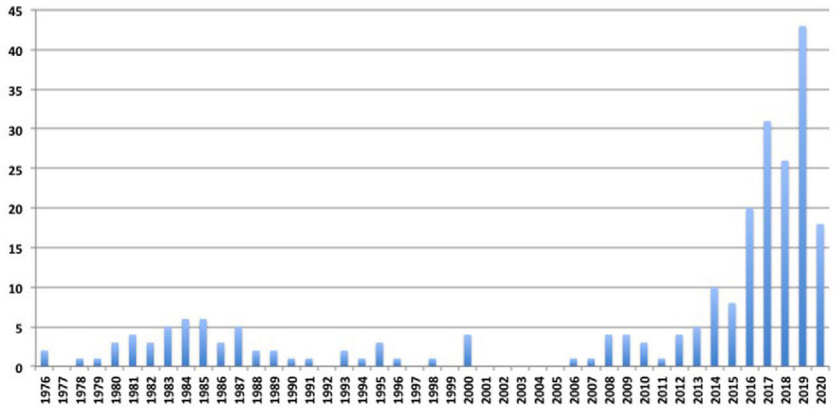

Fig. 1 – Number of incident cases in HHD/year.

to starting HHD of 0.2 years (range: 0–34.2 years), 165 (69.9%) were males, 71 (30.1%) females. Causes of chronic kidney disease (CKD) were diabetic kidney disease in 26 patients (11%), hypertensive/vascular cause in 22 (9.3%), glomerulonephritis in 40 (16.9%), polycystic liver and kidney disease in 36 (15.3%), chronic tubulointerstitial nephritis in 30 (12.7%), systemic disease in 15 (6.4%), other causes in 21 (8.9%), and in 46 (19.5%) the cause was unknown. Of all the patients, 45 (19.1%) gave up work as they were over the age of 65; 60 (25.4%) were working; 120 (50.8%) were unemployed despite being of working age; and in 11 (4.7%) cases there was no data on employment status. Therefore, 60 (31.4%) of the 191 patients under 65 years of age worked. In 76.7% of the patients, healthcare was provided by four centres in the Valencian Community.

Reasons for stopping HHD were as follows: 27 patients (11.4%) died; 81 (34.3%) had a kidney transplant; 41 (17.4%) switched to CHD; 2 (0.8%) switched to PD; and 1 (0.4%) was lost to follow-up. At the end of the observation period, 84 (35.6%) remained on HHD. The rates over the course of the follow-up for transplant, death and technique failure were 13.2, 4.4 and 7 events per 100 patient-years, respectively. Overall survival (event: death and leaving the programme, censoring kidney transplant) was 86.4% at one year, 81.5% at two years and 54.6% at five years. Technique survival (leaving the programme, censoring death and kidney transplant) was 90% at one year, 85.9% at two years and 69.4% at five years.

Considering the time period when HHD was started, it was found that 57 patients (24.2%) belonged to the old era, with 249.8 patient-years of follow-up (median 1,167 days/patient, IQR: 305–2,710), and 179 (75.8%) to the modern era, with 361.6 patient-years of follow-up (median 601 days/patient, IQR: 325–1,055). In the old era, 57.9% of the patients were treated by one single hospital (Hospital La Fe de Valencia), while in the modern era, 55.8% of the patients were treated by only two hospitals (34.6% Hospital General de Castellón and 21.2% Hospital Dr. Peset in Valencia). From the rest of the patients in the modern era, 16.8% were treated by Hospital General de Valencia, 20.1% by other nephrology clinics in the province of Valencia, and only 7.3% of the patients by clinics in the province of Alicante. Regarding the division of the patients by origin: 106 (44.9%) patients came for an ACKD consultation (256.5 patient-years of follow-up, median 742 days/patient, IQR: 218–1,284); 24 (10.2%) were PD transfers (43.7 patient-years of follow-up, median 445 days/patient, IQR: 229–1,092.5); 100 (42.4%) came from CHD (287.4 patient-years of follow-up, median 634.5 days/patient, IQR: 355–1,233.5); and six (2.5%) from kidney transplants (23.9 patient-years of follow-up, median 984.5 days/patient, IQR: 268–1,166). The baseline characteristics of the patients and reasons for stopping HHD are summarised in Table 1 by according to the the period they started and by origin.

Overall survival in the old era was 83.7% at one year, 77.4% at two years and 61% at five years, while in the modern era it was 87.3% at one year, 83% at two years and 47.8% at five years (Log Rank: 0.521). Technique survival in the old era was 85.4% at one year, 79% at two years and 64.1% at five years, while in the modern era it was 91.4% at one year, 88.5% at two years and 74.5% at five years (Log Rank: 0.195) (Fig. 2). The transplant, death and technique failure rates during the old era vs the modern era were 12.4 vs 13.8; 2.4 vs 5.8; and 7.6 vs 6.6 per 100 patient-years of follow-up, respectively. The relative risks of the modern era versus the old era were 1.11 (95% CI: 0.71–1.74) for the transplant event; 2.42 (95% CI: 0.98–5.99) for the death event; and 0.87 (95% CI: 0.48–1.59) for the technique failure event.

Overall and technique survival according to the patient's technique of origin are shown in Fig. 3; there were no statistically significant differences between groups.

In the Cox regression analysis of the entire series, the following were significant for overall survival in the univariate analysis: age, with an odds ratio (OR) of 1.03; 95% CI: 1.02–1.05 ($p < 0.01$); being diagnosed with heart disease: OR: 2.38; 95% CI: 1.34–4.25 ($p < 0.01$); vascular disease: OR: 2.57; 95% CI: 1.49–4.41 ($p < 0.01$); or active cancer: OR: 2.59; 95% CI: 1.11–6.03 ($p = 0.027$). All the factors were maintained in the multivariate analysis. For technique survival in the univariate analysis, being diagnosed with liver disease was significant, OR: 2.97; 95% CI: 1.16–7.63 ($p = 0.023$); and the mention of social problem, OR: 4.44; 95% CI: 1.05–18.72 ($p = 0.042$), and both factors being maintained in the multivariate analysis.

Table 1 – Baseline characteristics and reason for stopping, by era and origin.

	Era		Origin			
	1976–2000	2001–2020	ACKD	PD	CHD	Renal Tx
n	57	179	106	24	100	6
Age	37.5 ± 16	53.5 ± 14.3*	52.3 ± 16	53.3 ± 11.7	46.9 ± 16.8	34.7 ± 13**
Years on RRT	0.4 (0–9)	0.1 (0–34.2)	0 (0–0.1)	1.7 (0.2–5.7)	0.6 (0.1–8.7)	7.1 (2.4–34.2)**
Gender						
Male	45 (78.9%)	120 (67%)	71 (67%)	14 (58.3%)	74 (74%)	6 (100%)
Female	12 (21.1%)	59 (33%)	35 (33%)	10 (41.7%)	26 (26%)	0
Cause CKD						
DM	2 (3.5%)	24 (13.4%)*	17 (16%)	1 (4.2%)	8 (8%)	0
HTN/vascular	5 (8.8%)	17 (9.5%)	6 (5.7%)	7 (29.2%)	9 (9%)	0**
GN	9 (15.8%)	31 (17.3%)	16 (15.1%)	4 (16.7%)	18 (18%)	2 (33.3%)
PCLKD	5 (8.8%)	31 (17.3%)	16 (15.1%)	2 (8.3%)	18 (18%)	0
CTIN	14 (24.6%)	16 (8.9%)*	14 (13.2%)	2 (8.3%)	12 (12%)	2 (33.3%)
Systemic Disease	4 (7%)	11 (6.1%)	8 (7.5%)	3 (12.5%)	4 (4%)	0
Other	4 (7%)	17 (9.5%)	8 (7.5%)	1 (4.2%)	12 (12%)	0
Unknown	14 (24.6%)	32 (17.9%)	21 (19.8%)	4 (16.7%)	19 (19%)	2 (33.3%)
Origin						
mIncident	19 (33.3%)	87 (48.6%)*				
PD	1 (1.8%)	23 (12.8%)*				
CHD	33 (57.9%)	68 (38%)*				
Renal Tx	4 (7%)	1 (0.6%)*				
Reason for stopping						
Death of patient	6 (10.5%)	21 (11.7%)	14 (13.2%)	3 (12.5%)	9 (9%)	1 (16.7%)
Renal Tx	31 (54.4%)	50 (27.9%)*	33 (31.1%)	7 (29.2%)	39 (39%)	2 (33.3%)
CHD	17 (29.8%)	24 (13.4%)*	19 (17.9%)	3 (12.5%)	17 (17%)	2 (33.3%)
Continues	0	84 (46.9%)	39 (36.8%)	11 (45.8%)	33 (33%)	1 (16.7%)
PD	2 (3.5%)	0	1 (0.9%)	0	1 (1%)	0
Lost to follow-up	1 (1.8%)	0	0	0	1 (1%)	0
Morbidity						
DM	2 (3.5%)	28 (15.6%)*	21 (19.8%)*	1 (4.2%)	8 (8%)	0
Heart disease	4 (7%)	25 (14%)	16 (15.1%)	3 (12.5%)	10 (10%)	0
Vascular disease	6 (10.5%)	25 (14%)	17 (16%)	4 (16.7%)	10 (10%)	0
COPD	0	3 (1.7%)	2 (1.9%)	0	1 (1%)	0
Active cancer	0	10 (5.6%)	7 (6.6%)	0	3 (3%)	0
Systemic disease	6 (10.5%)	37 (20.7%)	22 (20.8%)	7 (29.2%)	14 (14%)	0
Liver disease	2 (3.5%)	11 (6.1%)	7 (6.6%)	2 (8.3%)	4 (4%)	0
Social problem	0	4 (2.2%)	1 (0.9%)	0	3 (3%)	0
Other	2 (3.5%)	23 (12.8%)*	12 (11.3%)	1 (4.2%)	12 (12%)	0

DM, diabetes mellitus; PD, peritoneal dialysis; CHD, in-centre haemodialysis; HTN, hypertension; COPD, chronic obstructive pulmonary disease; CKD, chronic kidney disease; ACKD, advanced chronic kidney disease; GN, glomerulonephritis; CTIN, chronic tubulointerstitial nephritis; PCLKD, polycystic liver and kidney disease; RRT, renal replacement therapy; Tx, transplant.
Categorical variables expressed as n (%), continuous variables as mean ± standard deviation or median (minimum-maximum).

* $p < 0.05$ between eras.

** $p < 0.05$ between origins.

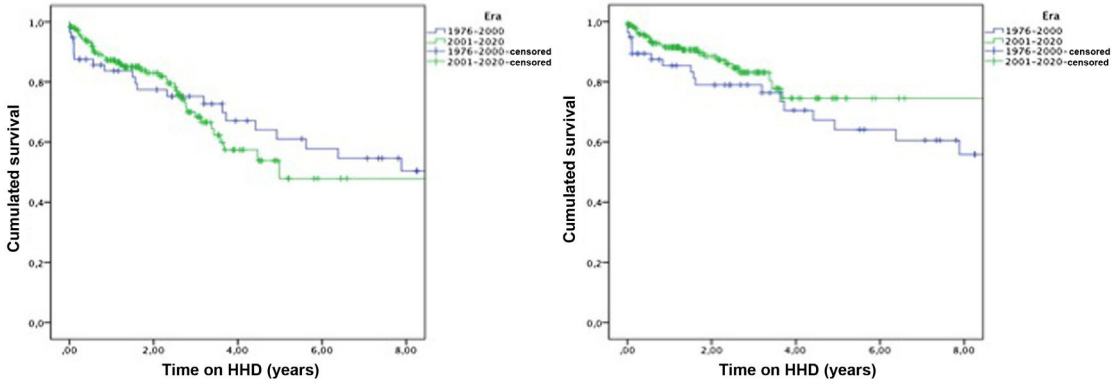

Fig. 2 – Overall and technique survival by eras.

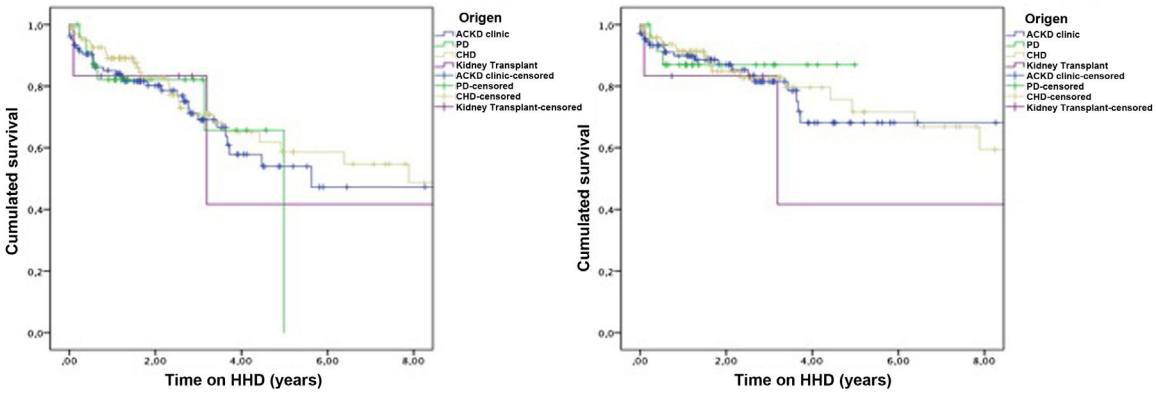

Fig. 3 – Overall and technique survival by origin.

Discussion

This study presents, for the first time, data on HHD patients in Spain from an official registry of kidney patients. We looked at overall patient characteristics and how they varied according to the era in which they started HHD and the survival of the technique over time.

Examining the incidence of patients on HHD over time in the Valencian Community, we found a first period of greater implementation (especially between 1980 and 1990), a period of decline (from 2001 to 2005 no patients started HHD) and a new revival with progressive growth, particularly from 2008 onwards; 58.5% of the patients in the series as a whole started HHD in the last five years. This reflects the growing interest in HHD worldwide, mainly in recent years, with more frequent HD and new monitors for HHD.[6]

Comparing the patient characteristics by era, it was striking the difference of 16 years between the average age of the patients in the old era (younger) compared to the modern era (older) and certainly this difference was statistically significant. In the modern era, it was also statistically significant the higher percentage of patients with diabetic kidney disease as the cause of CKD, as well as higher percentages of heart disease, vascular disease, chronic obstructive pulmonary disease, active cancer, liver disease and systemic disease. We believe that the selection criteria have been broader in more recent times and, in our opinion, that is a determining factor in the growth of HHD in the Valencian Community. However, we were unable to determine whether the fact that the patients are older and have more comorbidity might also be due to patients having access to better information about HHD, or to an expansion in the portfolio of services provided by the healthcare centres. There are helpful resources available, such as the MATCH-D criteria, created in 2013 (version 4) by the non-profit association Medical Education Institute,[7] which can be used as a basis for selecting patients for HHD. The patient has to be physically and intellectually capable, and above all must be motivated. Most patients are medically fit for HHD. It is the patients with more comorbidities the one who can obtained a greater benefit from more frequent dialysis.[8] One of the problems in the implementation of HHD programmes is poor familiarity with the technique, stemming from lack of experience due to limited use of HHD for many years.[9] Experience is gained with greater use of the technique, and then when the benefits of HHD are seen first-hand,[10] its use becomes more widespread. In a Spanish survey of 76 HD units regarding the on difficulties to be on HHD, lack of training and motivation on the part of healthcare personnel were highlighted as two of the main obstacles to the implementation of HHD programmes.[11]

Interestingly, there was a centre effect in the development of HHD programmes. In the old era, 57.9% of the patients were centralised in one single hospital, while in the modern era, 55.8% of the patients were centralised between two hospitals. This led us to think that, at least in the modern era, as human resources have not been increased specifically for the development of the different HHD programmes, their implementation is effectively determined by the motivation of the nephrology teams. If further growth in HHD is intended, one of the obstacles that needs to be overcome is the extra workload for nephrologists, and responsibility for that lies with the governing bodies. Work overload could even lead to the failure of some programmes if they are set up with more good intentions than resources. The role of nephrologists should be to advise and inform about the benefits of HHD. As a good example of this, the data from our study showed the rate of reintegration into the labour market among patients who were of working age to be 31.4%. In a Spanish study of 243 patients of working age on RRT,[12] 21.7% of those on CHD were working, with this figure rising to 39% among transplant patients and 39.7% among PD patients (47.8% automated PD and 28.1% continuous ambulatory PD).

In the modern era was the higher percentage of patients who came from an outpatient clinic, that is, the ACKD consultation becoming a fundamental component in the implementation of HHD.[13] In fact, the entire nephrology team (doctors and nurses) must be predisposed to promote HHD and be able to identify suitable patients for the technique. This process needs to be multidisciplinary and should start as soon as possible, with glomerular filtration rates below 30 ml/min, so that the decision process is complete when the glomerular fil-

tration rate falls below 20 ml/min, especially in patients with more severe progression.[14] Also important among our findings was the increase in patients transferred from PD in the modern era, this allowing them to continue benefiting from home therapy. This is what has been called the integrated home dialysis model,[6] starting on PD and later, if the patient has not been transplanted, switching to HHD. This model has shown excellent results in Australian cohorts,[6,15] with a transfer rate from PD to HHD of 5.4% (with negative predictors of transfer being age, DM as a cause of CKD, and stopping PD due to infection; and positive predictive factors being male gender and longer time on PD),[15] In Canadian cohorts,[16,17] the rate of transfer to HHD was 14% among those stopping PD, with the largest programmes paradoxically having the lowest rate of transfers to HHD. This draws attention to the fact that keeping the patient on PD despite complications that can occur repeatedly can end up exhausting the patient, thereby reducing the likelihood of transfer to HHD and as such of benefiting from the integrated home dialysis model. The greater trend that we found in technique survival in the patients coming from PD, although not statistically significant, would support this model.

Regarding overall and technique survival, our data were similar to Canadian cohorts from selected centres in nocturnal haemodialysis,[18] where out of 579 patients, with a mean age of 50 and a median of two years on RRT, technique survival (technique failure event) and patient survival (death event, censoring on this occasion technique failure) were 90% and 83% at one year and 94% and 87% at two years, respectively. In this series of Canadian centres with experience in HHD from 2000 to 2010, the factors predicting both technique failure and mortality were the centre where the patient was being treated and age. Our data were better than those of the Canadian registry of patients with kidney disease, where out of 1,869 incident patients on HHD[19] from 1996 to 2012, rates for technique failure and death were 13.2 and 7.1 events per 100 patient-years of follow-up, respectively. The risk of technique failure at one year was 18%, with their results showing a slightly higher age than our series, a higher percentage of comorbidity, a longer previous time on RRT and 50% on conventional HD at home. Data from the Canadian registry also showed higher likelihoods of technique failure in the modern era, with older age and higher prevalence of diabetic kidney disease in this more recent period, and with the rate of central venous catheter use high at 39%. In other studies, the catheter has been shown to be a predictor of technique failure and death in HHD,[20] which would explain these poorer outcomes.

Comparing our results with data from ANZDATA,[21] also in older patients with more comorbidity than in our series, particularly DM, the figures were somewhat better than the Canadian data, but did not match ours. In incident Australian patients on HHD during the period 2010–2012, overall survival (death-technique failure event) and technique survival (technique failure event) were 73.8% and 79.8% at one year, 42.5% and 56.6% at three years and 21.3% and 39.4% at five years, respectively. The fact that the Australian data are better might also be due to a greater use of arteriovenous fistulas compared to Canadian series.[22]

In American series, Weindhandl et al.[23] reported 21.3 discontinuations due to technique failure every 100 patient-years of follow-up, with a technique survival rate of 72.5% at one year and 67.9% at two years, out of 4,201 patients on daily HD at home, with patients with the NxStage System One (mean age 53.8 years, diabetic kidney disease 33.7%). These poorer outcomes can be attributed to factors that have been associated with the composite of death and technique failure in HHD, such as age, DM as a cause of CKD or a longer previous time on RRT.[17]

In British series, Jayanti et al.,[24] on 166 patients on HHD found technique survival rates of 90.2%, 87.4% and 81.5% at one year, two years and five years, respectively, considering the entire training and home period; they identified DM and heart failure as predictors of technique failure and the training period as a critical moment for failure in HHD.

In other multinational European series, in this case with the NxStage System One,[25] in a short-daily regimen, for 129 patients with a mean age of 49 years, the mortality rate was 5.4 events per 100 patient-years of follow-up, similar to the figure we have reported.

In our study, despite increasing comorbidity and patient age in the modern era, technique survival increased, with overall survival decreasing only slightly (death and technique failure events). A greater increase in both patient age and comorbid conditions could lead to lower overall and technique survival rates. However, we still have a long way to go before HHD would be extended to people of even older ages and with more comorbidities, as they do in other countries, to the extent that these values would suffer, as occurred in the above international series. In our series, age and comorbidity, DM in particular, were predictors of overall patient survival. In older age groups, HHD has been shown to maintain patient survival in the technique at acceptable levels,[26] and the increase in comorbidity could be helped by the use of nursing support systems,[27] more care and attention in the training period and subsequent follow-up, and in the development of telemedicine systems. It is surprising how little are used such systems in HHD programs when their ability to increase technique survival for patients has been demonstrated already.[28] Telemedicine systems do not need to be real-time,[29] they should not overwhelm healthcare personnel or encourage the patient to relax in terms of self-protection measures.[30]

Our study has limitations since our data were extracted from a registry. There is a lack of data on vascular access, residual renal function and the exact type of HD regimen used in each case (although in the modern era we know that more frequent HD is the most widely used).All these factor can influence both overall and technique survival. There were also no data collected on why the technique was changed, which might have clarified the exact reasons for both starting and discontinuing HHD. However, we provide data from an official registry, which can help us understand the changes occurring at present in HHD in Spain.

Conclusion

In the modern era there has been a considerable increase in patients on HHD in the Valencian Community. The patients were older and had more comorbidity than in the previous period, however these factors did not affect either technique or overall survival in HHD. A higher percentage of patients in the modern era started HHD from an outpatient clinic and from peritoneal dialysis, with a trend, although not significant, towards better technique survival among patients transferred from PD. We found that in terms of the development of HHD programmes, the centre effect was maintained between eras, although it was not so striking in the more recent period.

Conflicts of interest

Dr Pérez Alba has received fees for presentations on home haemodialysis from Baxter.

Acknowledgements

We would like to thank the Registro de Enfermos Renales de la Comunidad Valenciana [Valencian Community Registry of Patients with Kidney Disease] for its predisposition and ease in obtaining the data that we have analysed in this manuscript.

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