

To assess the quality of life in patients with chronic kidney disease undergoing hemodialysis at a satellite clinic, comparing patients from a median low-income household with patients from median middle- and upper-income households: cross-sectional study

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Abstract

Background: Chronic kidney disease is a financial challenge for global public health due to rising costs, a poorer quality of life. Globally, there has been an increase in the number of diabetic, hypertensive and obese patients, with a tendency to rise as life expectancy increases.

Objective: To assess the quality of life of patients with chronic kidney disease on hemodialysis at a satellite clinic in Recife, Northeast Brazil, and comparing low-income patients funded by the national healthcare system with middle- and higher-income patients funded by private health insurance.

Methods: The Medical Outcomes Study Questionnaire Short Form 36 Health Survey (SF-36) was applied, together with a complementary interview with socio-demographic data for all patients at a conventional hemodialysis clinic. All patients were submitted to the same hemodialysis protocol, 4 hours and 10 minutes, high flow biocompatible membranes with high mass transfer coefficient and an adequacy of $Kt/V \geq 1.2$.

Results: The poorest quality of life scores with the SF-36 were related to physical functioning and pain. The best scores were attributed to mental health, social functioning, general health and vitality with no differences between the household incomes. There was a positive association between education, role-emotional and physical functioning. Longer hemodialysis treatment times demonstrated a positive association with aspects of general health. Patients who had undergone hemodialysis between one and five years presented better quality of life scores with the SF-36.

Conclusions: Hemodialysis treatment negatively influences the quality of life of patients with chronic kidney disease. Education seems to help patients to better understand and accept treatment, by raising the scores of the physical functioning and role-physical. The first year of hemodialysis seems to exert a more negative influence on the quality of life. Among all patients, pain and physical aspects seem to be the critical points, regardless of social class or income.

Background

Chronic Kidney Disease (CKD) is a financial challenge for global public health [1] due to rising costs, a poorer quality of life and psychosocial factors [2]. Globally, there has been an increase in the number of diabetic, hypertensive and obese patients, with a tendency to rise as life expectancy increases [3].

However, with the continuing shortage of donor kidneys, most patients with end-stage renal disease (ESRD) will need some form of dialysis during their lifetime. To date, no consensus has been reached as to whether peritoneal dialysis (PD) or hemodialysis (HD) offer patients a better chance of survival [4].

The difference between patient demand and the system's ability to absorb this population has put health systems at risk. According to the Brazilian Society of Nephrology (SBN), in 2000 there were 42.695 patients on HD and a prevalence of HD of 503 per million population (pmp). In 2017, there were an estimated 126.583 patients on HD, 80% [5] of whom were funded entirely by the Brazilian public health system (known as SUS), corresponding to a prevalence of 610 pmp. In some regions of Brazil there is a waiting period of up to four months for a vacancy at a hemodialysis satellite clinic. Available Brazilian data, although as yet unpublished, have demonstrated a total of 133.964 hemodialysis patients with a prevalence of 640 pmp, 92.3% maintained by SUS, with a kidney transplant waiting list of 29.545 [6].

For these previously mentioned reasons, conventional four-hour HD, three times a week, has become the fastest manner with which to reverse the critical symptoms of uremic syndrome and to quickly reverse the disparities regarding access to the public health system [7] [8]. However, while hemodialysis promotes life in the biological sense of the word, it also causes a further limiting factor, in that it imposes immobility onto human beings and the creation of a binomial man/artificial kidney dependence. Studies have demonstrated that this process of dependence may favor major depressive disorder, recurrent depressive disorder and suicide [9].

Depressive disorder is the most common psychiatric condition in patients with ESRD, with a prevalence of up to 100% in patients with CKD, varying according to the criteria used and the population studied. In Brazil, in two studies involving patients undergoing hemodialysis, the prevalence of major depressive disorder was 44.8% using the Beck Depression Inventory (BDI), and 7.8% with the 10-item version of the Center for Epidemiologic Studies Depression Scale (CES-D). A meta-analysis with hemodialysis patients presented increased depression and risk of psychiatric disorder-related hospitalization when compared with patients undergoing conservative treatment and post-renal transplantation [10]

With the evolution of hemodialysis and peritoneal dialysis techniques, it has been possible to reduce mortality and increase the life span of these patients. However, a new concern has arisen amongst nephrologists. It is not simply enough to remain alive; it is necessary to offer these patients comfort and a better quality of life (QoL) [11].

Chronic kidney disease decreases both physical and professional functioning, imposes limits onto social relationships and causes problems related to mental health. There is no consensus in the medical literature on the items that should be taken into consideration when assessing the quality of life of patients with CKD. In order to understand the process between care and a sensation of well-being (positivity), several generic QoL questionnaires have been produced for patients with chronic diseases. Amongst these questionnaires, the international literature has demonstrated the effectiveness of the Medical Outcomes Study Questionnaire Short Form 36 Health Survey (SF-36) [12].

In Brazil, in 1997, Ciconelli et al. validated and adapted the SF-36 by applying the questionnaire to rheumatoid arthritis patients at the Universidade Federal de São Paulo, Brazil [13]. Since then, the questionnaire has been applied in order to assess patients with several chronic diseases, thereby providing an excellent performance and methodological correlation. The SF-36 was therefore selected due to the translation and linguistic adaptation into the Portuguese language, and because it is a generic quality of life assessment (QoL) tool, which is simple to understand and administer [13]. It is also sufficiently succinct and may therefore be applied in a hemodialysis setting where procedures are fast and there is a risk of accidents. Another study in the metropolitan region of São Paulo, Brazil, used the same instrument to assess the QoL of patients with CKD in eight satellite dialysis clinics. In this work, the SF36 was applied with no technical difficulties, analyzing a total of 80 patients, who were initiating HD treatment with an HD period of less than or equal to three months. A significant impairment was observed in the physical and emotional conditions of this population [14].

Objective

The objective of the present study was to assess the quality of life (QoL) of patients with CKD on HD at a satellite clinic in the city of Recife, Northeast Brazil, serving patients from the public sector (funded by SUS) with a median monthly household income of between US\$ 78.00-281.00, and the private sector (funded by private health insurance) with a median monthly household income of between US\$ 647.00–4.210,00.

Methods

This was a cross-sectional, descriptive, unicentric, individualized, randomized study of patients on conventional HD, in a satellite clinic that treated public sector, low-income patients, funded by the Brazilian healthcare system (SUS) and private sector, middle- and upper-income patients funded by private health insurance. All patients (N = 225) were ≥ 18 years old and had been undergoing conventional hemodialysis at least three times a week for four hours during a minimum period of three months. All patients were treated on a 4008s V10 (Fresenius Medical Care AG, Bad Homburg, Germany)[™] machine with Fresenius Medical Care[™] high-flow polysulfone (HDF80) capillaries (1.8 m² surface area, ultrafiltration coefficient (K_{UF}) = 60 mL/h/mmHg, mass transfer coefficient (KoA = 945 mmHg) and had (urea adequacy) measured by Kt/V balanced urea clearance ≥ 1.2 [15] [16]. Patients were excluded if they presented with Alzheimer's disease, neurodegenerative diseases, disorientation, organic difficulties or intellectual deficit that prevented applying the SF-36, and if they were hospitalized while the questionnaire was being applied. The SF-36 questionnaire was applied, and a complementary interview was conducted made up of questions regarding the type of health insurance (SUS or private health insurance), median household income, civil status, education and time spent on hemodialysis.

Location and period of the study

The study was conducted at a healthcare satellite clinic, in Recife, the state capital of Pernambuco, in the Northeast of Brazil, in August 2011.

Calculating the SF-36 scores

The scores were calculated according to the international standardization of the Quality Metric SF Health Surveys [17].

Statistical analysis

Initially, we performed a descriptive analysis, and the homoscedasticity (Bartlett's test) and the normality of the continuous data were verified with the Kolmogorov-Smirnov test to assess normality. Categorical variables were expressed by their frequencies and percentages. The software used was Microsoft Excel 2013[™] and the statistical treatment was performed with IBM SPSS Statistics Base V20[™] for the results obtained and to present the means, proportions and standard deviation of the measured variables, in order to compare the QoL scores from the SF-36. With regard to the variable on the source of funding (health insurance) and sex, the Least Significant Difference test was applied.

For the comparative analysis of the scores regarding the time spent on hemodialysis and education, the variance test (ANOVA) was applied. To test the contrasts, the Levene test was applied to verify the assumption of homogeneity of variance. When homogeneity was verified, Fisher's exact test was used. In cases with no homogeneity, the Tamhane test was performed. For all analyzes, a p-value < 0.05 was adopted.

Results

The study group was made up of 225 randomly selected CKD patients on HD. Thirty-seven patients were excluded because they refused to participate. Thirteen had undergone kidney transplantation, one died, six presented with cognitive impairment that prevented application of the SF36, three presented with Alzheimer's disease and two were hospitalized, thereby leaving a total of 163 patients able to take part in the study (Fig. 1).

The mean age was 52.07 ± 15 years. There was a male prevalence of 62%, against 38% female. Most patients (66.9%) were retired and 58.5% were married (Table 1). The poorest rated dimensions in the SF-36 questionnaire were physical functioning with 31 points \pm 31 SD and pain 43 ± 11.58 points (Table-2).

Table-1. Distribution of patients undergoing hemodialysis with regard to sociodemographic characteristics.

Variable	N (163)		%
Age group in years			
20 – 30	13		08.1
30 – 40	31		19.4
40 – 50	29		18.1
50 – 60	37		23.1
60 – 70	29		18.1
70 – 80	17		10.6
80 – 90	4		02.5
Sex			
Male	101		62.0
Female	062		38.0
Profession			
Retired	109		66.9
Housework	8		04.9
Had never worked	6		03.7
Entrepreneur	6		03.7
Trader	4		02.5
Others	30		18.4
Civil status			
Single	42		26.4
Married	93		58.5
Divorced	15		09.4
Widowed	09		05.7
Education		Years*	
Unable to read or write		04	02.5
Primary school (incomplete)	< 1	29	18.2
Primary school (complete)	< 5	26	16.4
Secondary school (incomplete)	5-10	06	03.8
Secondary school (complete)	11-12	54	34.0
Higher education (incomplete)	13-16	08	05.0

Higher education (complete)	17-20	27	17.0
Post-graduate studies	> 21	05	03.1

Note: time spent at school in years

Table-2. Distribution of patients undergoing hemodialysis with regard to quality of life scores (SF-36) amongst all patients.

SF-36 Scores	N	Median	Min-Max	SD
Physical functioning	163	49.79	00-100	30.96
Role-physical	163	31.13*	00-100	38.60
Pain	163	43.04*	10-084	11.58
General health status	163	57.53	10-100	21.46
Vitality	163	54.69	00-100	23.72
Social functioning	163	61.12	00-100	25.91
Role-emotional	163	40.70	00-100	42.39
Mental health	163	68.56	04-100	21.73
Note: *The physical component and pain presented the worst median scores with the SF 36 SD (standard deviation), Min-Max (minimum-maximum score values).				

With regard to education, 34.0% had completed secondary school, which corresponds to between 10 and 12 years of study. While the mean time on hemodialysis (HD) amongst patients was 5.48 ± 5.37 years, 46% had been on HD between one and five years (Table 3).

Table-3. Statistical analysis and distribution of patients undergoing hemodialysis with regard to the quality of life according to the time spent on hemodialysis.

Time spent on hemodialysis in	N	Median	Min-Max	SD ^b	p-value
Physical functioning					
Up to 1 year	30	45.83	00-100	29,22	-
1 – 5 years	75	51.53	00-100	31,19	-
> 5 years	58	49.57	00-100	31,85	0,696
Role-physical					
Up to 1 year	30	21.67	00-100	31,98	-
1 – 5 years	75	34,00	00-100	38,48	-
> 5 years	58	32.33	00-100	41,63	0,323
Pain					
Up to 1 year	30	47.37	10-84	13,83	-
1 – 5 years	75	41.77	20-62	10,86	-
> 5 years	58	42.43	21-64	10,89	0,072
General health status					
Up to 1 year	30	51.30	20-092	22,51	-
1 – 5 years	75	61.75	10-100	19,73	0,024*
> 5 years	58	55.31	15-100	22,30	-
Vitality					
Up to 1 year	30	54.17	05-100	23,57	-
1 – 5 years	75	56.20	00-100	25,35	-
> 5 years	58	53.02	05-100	21,84	0,741
Social functioning					
Up to 1 year	30	59.58	12-100	24,71	-
1 – 5 years	75	62.00	00-100	26,03	-
> 5 years	58	60.78	00-100	26,74	0,905
Role-emotional					
Up to 1 year	30	26.67	00-100	36,51	-
1 – 5 years	75	42.22	00-100	43,27	-
> 5 years	58	45.98	00-100	43,18	0,117
Mental health					

Up to 1 year	30	66.80	04-092	19,26	-
1 - 5 years	75	69.28	08-100	22,88	-
> 5 years	58	68.55	20-100	21,71	0,871

Notes: a) Hemodialysis b) SD Standard deviation

*Only the (1 -| 5) hemodialysis group presented an improvement in the SF 36 general health score in relation to the group < 1year and the group with over 5 years of hemodialysis.

A total of 46.3% of the treatment was provided entirely free of charge to patients, funded by the Brazilian public health system (SUS) and 53.7% was funded by private health insurance. There was no difference in the SF-36 scores between SUS-funded patients with a median household income of US\$ 206–359,00 and those with other private arrangements with a median household income of US\$ 647- 4.222,00 (Table 4).

Table 4

– Statistical analysis and distribution of patients undergoing hemodialysis with regard to the quality of life scores according to the type of funding.

Type of funding	Nº	Median	Min-Max	SD	p-value
Physical Functioning					
SUS	75	48,80	00-100	29,48	
Private	87	50,34	00-100	32,39	0.753
Role-physical					
SUS	75	28,67	00-100	38,05	
Private	87	32,47	00-100	38,71	0.530
Pain					
SUS	75	42,15	20–060	10,12	
Private	87	43,79	10–084	12,78	0.370
General health status					
SUS	75	57,39	10–100	21,92	
Private	87	57,17	15–097	20,81	0.949
Vitality					
SUS	75	51,87	00-100	25,95	
Private	87	56,95	05-100	21,58	0.175
Social functioning					
SUS	75	58,33	00-100	28.05	
Private	87	63,51	00-100	23.98	0.208
Role-emotional					
SUS	75	36,89	00-100	41,22	
Private	87	43,30	00-100	43,17	0.338
Mental health					
SUS	75	66,40	12–100	24,33	
Private	87	70,07	04-100	19,03	0.292
Note: SD (standard deviation), Min-Max (minimum-maximum score values), SUS – the Brazilian public healthcare system for low-income patients; Private – middle/higher-income patients with private health insurance.					

In the general health component, with regards to the time of hemodialysis, patients who had spent between one and five years ($p = 0.024$) presented a higher QoL score. No differences were observed between patients with care funded by SUS or by private health insurance (Table 5). No differences were identified between sexes regarding the QoL (Table-5).

Table 5

– Statistical analysis and distribution of patients undergoing hemodialysis with regard to the quality of life scores according to sex.

Sex	N	Median	Min-Max	SD	p-value
Physical functioning					
Male	101	52,33	00-100	31,28	
Female	62	45,65	00-100	30,22	0,182
Role-physical					
Male	101	31,19	00-100	38,80	
Female	62	31,05	00-100	38,59	0,982
Pain					
Male	101	42,13	20-084	11,98	
Female	62	44,52	10-064	10,83	0,202
General health status					
Male	101	59,30	10-100	20,66	
Female	62	54,66	15-097	22,59	0,181
Vitality					
Male	101	55,05	00-100	22,74	
Female	62	54,11	05-100	25,42	0,808
Social functioning					
Male	101	61,39	00-100	25,50	
Female	62	60,69	00-100	26,77	0,867
Role-emotional					
Male	101	42,90	00-100	42,78	
Female	62	37,10	00-100	41,86	0,398
Mental health					
Male	101	69,27	04-100	20,57	
Female	62	67,42	08-100	23,62	0,612
Note: SD (standard deviation), Min-Max (minimum- maximum score values)					

Table 6

– Distribution of patients undergoing hemodialysis with regard to the SF 36 scores according to education.

Education	Time of study in years	N	Min-Max	Median	SD	p-value
Physical functioning						
Primary school	< 5	59	00-100	42,20	30,53	-
Secondary school	5–10	60	00-100	51,58	31,09	-
Higher or postgraduate education	> 10	40	00–95	57,00	29,78	0.051
Role-physical						
Primary school	< 5	59	00-100	22,46	34,96	-
Secondary school	5–10	60	00-100	32,50	37,20	-
Higher or postgraduate education	> 10	40	00-100	37,50	42,74	0.128
Pain						
Primary school	< 5	59	10–64	42,56	12,35	-
Secondary school	5–10	60	21–84	44,80	11,18	-
Higher or postgraduate education	> 10	40	20–54	41,10	11,22	0.278
General health status						
Primary school	< 5	59	10–100	57,25	21,92	-
Secondary school	5–10	60	20–100	55,97	20,49	-
Higher or postgraduate education	> 10	40	15–100	61,40	22,24	0.451
Vitality						
Primary school	< 5	59	05-100	51,53	24,62	-
Secondary school	5–10	60	00–090	52,17	23,80	-
Higher or postgraduate education	> 10	40	15–100	61,50	20,48	0.08
Social functioning						
Primary school	< 5	59	00-100	57,42	29,65	-
Secondary school	5 a 10	60	12–100	62,71	23,30	-
Higher or postgraduate education	> 10	40	12–100	63,13	22,10	0.43
Role-emotional						
Primary school	< 5	59	00-100	31,64	39,84	-
Secondary school	5–10	60	00-100	38,33	38,73	-
Higher or postgraduate education	> 10	40	00-100	54,17	46,95	0.03*
Mental health						

Education	Time of study in years	N	Min-Max	Median	SD	p-value
Primary school	< 5	59	20–100	65,56	21,27	-
Secondary school	5–10	60	04-100	67,07	24,33	-
Higher or postgraduate education	> 10	40	36–100	74,70	16,36	0.097
* Note: There was a difference in the comparison between the three groups in the role-emotional between the primary school and higher or postgraduate education groups; SD (standard deviation), Min-Max (minimum-maximum score values)						

Individuals with a higher education and postgraduate education with > 10 years of schooling presented higher QoL scores in role-emotional when compared to primary and secondary education, $p = 0.03$ (Table-6).

Discussion:

The increase in the age range of patients on renal replacement therapy (RRT) observed in this study, as in all other countries, may be justified by the increased prevalence of CKD in older people. More than half of the patients on chronic HD worldwide are estimated to be aged over 65 years. Data from the Brazilian Society of Nephrology (SBN) demonstrate a prevalence of over 34% of patients aged over 65 years [18].

In Brazil, similar to the world trend, there has been increase in ESRD and, consequently, a growth of RRT, which has directly affected the number of renal patients, thereby causing a progressive increase of patients on hemodialysis. According to the Brazilian Society of Nephrology (SBN), in 2000, there were 42.695 HD patients and a prevalence of 503 pmp. In 2018, there was an estimated 133.464 patients, corresponding to a prevalence of 640 pmp aged ≥ 65 years [18].

A higher percentage of males is observed in most studies and correlates with the higher prevalence of CKD and its progression in men, and in African descendants (multiracial or biracial), which is compatible with the population of Recife, Brazil [19].

The significant number of retired patients with CKD may be justified by the following facts: the increasing age of older people, difficulty in reconciling employment and the process of physical and mental adaptation during the first years of HD [20]. This is consistent with other studies that have demonstrated a negative impact of CKD on financial income, especially during the first year of HD treatment [21] [22].

Having a partner, being married or a family caregiver seems to contribute positively to the QoL. Patients who have family support and find themselves part of a network of affection, obligations and mutual help demonstrate better adaptation to treatment and lower mortality when compared to those who live alone [23]. The literature reveals social support to be an important resource for those suffering with chronic disease, predisposing to a better QoL based on good relationships and positive adjustment to human suffering [23].

Although the education of patients on HD in the present study was above the national average, this data contrasts with the average of most Brazilian studies, in which there is a predominance of patients with a maximum of five years at school (low education). In a study in Rio Grande do Sul (South Brazil) Zambonato et al. observed lower educational levels amongst patients on chronic hemodialysis when compared to the general population, who were not on HD [25]. However, this was not so evident in the present study. A total of 50.34% of patients had private health

insurance, a group that generally includes the middle/upper-middle classes with a median household income of US\$ 647 – 4.210,00 and consequently a higher purchasing power, in relation to the poorer classes (poor, extremely poor or vulnerable) with a median household income of US\$ 78–281.00 [12]. According to the Brazilian dialysis census 2018, the data from this satellite clinic are different from Brazilian data, in which SUS is responsible for funding 92.2% of all HD [18].

Regardless of social status or the median household income, the QoL results were similar to those observed in other Brazilian studies, in which better scores regarding the mental component, social functioning, mental health and role-emotional, were observed. Moreover, poorer QoL scores were observed in the dimensions of the physical component [25] [26]. There was evidence of improvement in the physical component after stimulation with regular exercise in patients undergoing HD [29]. However, this is not common practice in hemodialysis satellite clinics in Brazil.

During the first year of hemodialysis, patients undergo a series of physical, psychic and social adaptations. These adaptations have a negative influence over the QoL. During the first year, this negative impact tends to decrease when uremic toxins are reduced, anemia is corrected, anorexia is reduced and there is muscle mass gain [21]. However, over the years, the chronic complications of CKD begin to surface, such as renal osteodystrophy, osteometabolic disease and left ventricular hypertrophy [28], and the emergence of other comorbidities caused by accelerated aging. As observed in studies by Kuro-o et al on elevated fibroblast growth factor-23 (FGF-23), klotho gene expression changes and soluble klotho (antiaging protein) decrease [30]. Thereby conferring a new exacerbation of loss of QoL [32] [31].

Cruz et al. also observed a positive association of education and the QoL. This evidence may be associated with having a higher level of understanding, social status and median household income. These patients apparently seek and have access to more knowledge on CKD and its treatments, which may produce a more positive attitude towards disease and adherence to therapy [32].

How limitation of the study there was a selection bias in having used a single hemodialysis satellite center. However, the clinic presented one important feature: a similar number of low-income public (SUS) patients and private patients with incomes above the national average. Nevertheless, even with the financial differences, they all received the same quality conditions of RRT, regarding time, and high flow capillary and adequacy (Kt/V).

Conclusions

Hemodialysis may worsen the QoL of patients with chronic kidney disease. Education and a higher median household income seem to be associated with better QoL indices with regard to role-emotional and physical functioning. The first year of hemodialysis represents the worst period during the QoL of patients, irrespective of social status and income. Among all patients, pain and physical aspects seem to be the critical points in quality of life, regardless of social class or income.

Recommendations

A broader and more humane approach by the multi-professional team is required during the first year. Providing special care in receiving these patients seems to be a turning point in the field of improving the QoL.

Declarations

Ethical approval

The study complied with all the necessary procedures and was approved by the Research Ethics Committee at the Agamenon Magalhães Hospital in Recife, Pernambuco, Brazil, and platform Brazil. All participants signed the informed consent forms. All data was kept confidential. The study complied with the Helsinki declaration revised in 2000, and is in accordance with Brazilian Ethics Committees, Resolution 466/2012 and 510/2016 of the Brazilian National Health Council.

Informed consent

Informed consent was obtained from all participants included in the study.

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Competing interests

The authors declare that they have no competing interests.

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Abbreviations

Chronic Kidney Disease (CKD); End-stage renal disease (ESRD); Peritoneal dialysis (PD); Hemodialysis (HD); Kt/V (balanced urea clearance) ; Brazilian Society of Nephrology (SBN); Per million population (pmp); Beck Depression Inventory (BDI); Center for Epidemiologic Studies Depression Scale (CES-D); Quality of life (QoL); SD (standard deviation); Min-Max (minimum-maximum score values); Medical Outcomes Study Questionnaire; Short Form 36 Health Survey (SF-36); Brazilian healthcare system (SUS); Renal replacement therapy (RRT); Fibroblast growth factor-23 (FGF-23).

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Figures

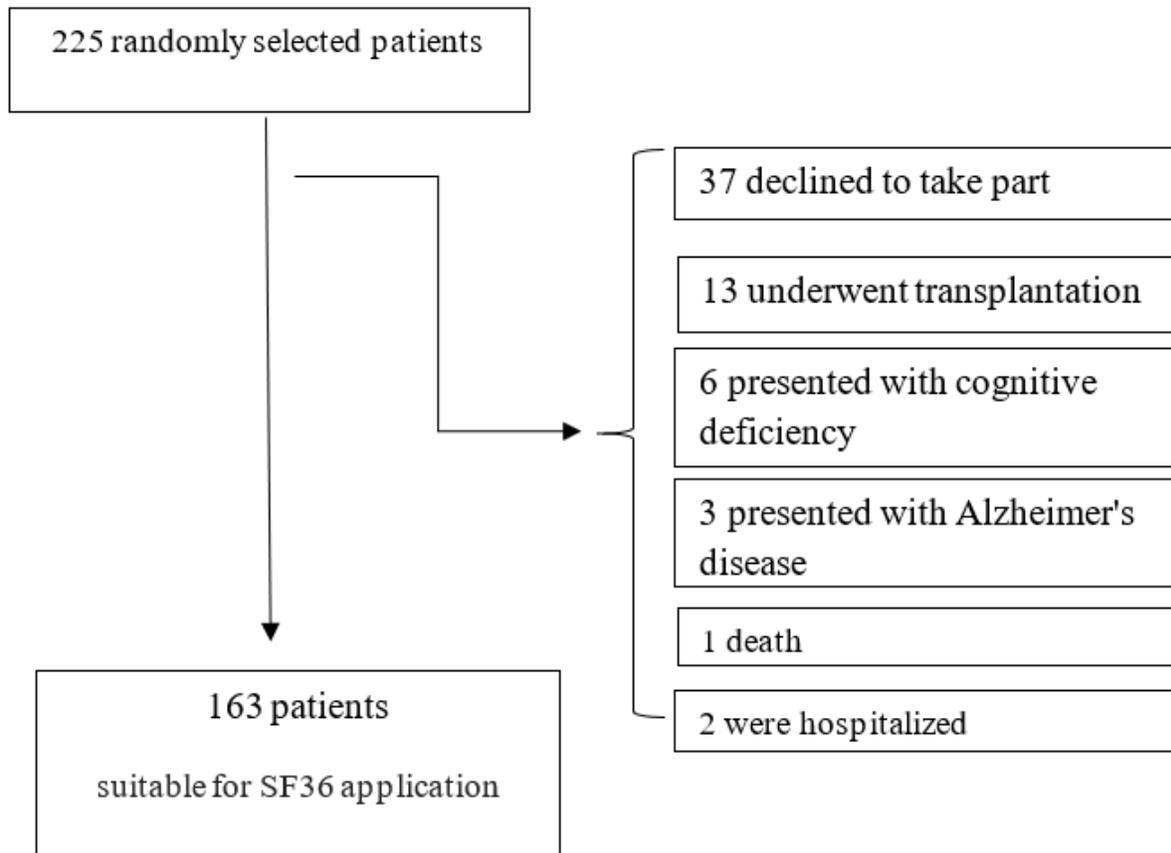


Figure 1

Patient selection algorithm at a satellite clinic