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Description of a disease management model in patients undergoing dialysis in Colombia

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Abstract

Introduction: Management Models of Disease (MMD) allows one to identify risks and prioritize interventions to achieve better clinical outcomes. This work aims to describe a MMD designed for a population on dialysis and identify the cardiovascular risk factors and metabolic diseases in this population.

Methods: MMD described. We included patients older than 18 years, receiving dialysis between March 1stand August 31st2013; demographic variables were assessed and baseline clinical and risk factors wereidentified according to the presence of diabetes. For the analysisdescriptive statistics in Stata® 12 was used.

Results: 2219 patients were analyzed, 1004 (45.24%) of them were diabetic, 624 (28.1%) had a history of cardiovascular disease, 990 (94.37%) reported some alteration in the echocardiogram, being the most frequent the hypertensive cardiopathy in the 58.63%. As a result, the total number of patients on hemodialysis was 271 (13%), and on peritoneal dialysis112 (5%) had poor control of blood volume, high CRP in the 64.4% and TSH >10 IU/ml in 12.1% of the subjects. The ankle-brachial index (ITB) was found altered in 37.5% of diabetics, versus 21.8% in non-diabetics ($p<0.001$); differences were observed for the overweight population; 40.03% vs. 26.91%, in diabetics and non-diabetics, respectively.

Conclusions: This disease management model is based on agency of cases and integration of networks of services may be a high impact response to populations in dialysis with important comorbidity.

Key Words: Cardiovascular risk factors, dialysis, terminal chronic renal disease, management of disease.

Descripción de un modelo de gestión de enfermedad en una población en diálisis en Colombia

Resumen

Introducción: Los Modelos de Gestión de Enfermedad (MGE) permiten identificar riesgos y priorizar intervenciones para lograr mejores desenlaces clínicos. Este trabajo tiene por objetivo describir un MGE diseñado para una población en diálisis e identificar los factores de riesgo cardiovascular y metabólico en dicha población.

Métodos: Se describe el MGE. Se incluyeron pacientes mayores de 18 años, prevalentes en diálisis entre el 1º de marzo y el 31 de agosto de 2013; se evaluaron variables demográficas y clínicas basales, y se identificaron factores de riesgo según la presencia de diabetes. Para el análisis se usó estadística descriptiva en Stata® 12.

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Resultados: Se analizaron 2219 pacientes, 1004 (45.24%) de ellos eran diabéticos, 624 (28.1%) tuvieron antecedentes de enfermedad cardiovascular, en 990 (94.37%) se reportó alguna alteración en el ecocardiograma, siendo la más frecuente la cardiopatía hipertensiva en el 58.63%. Se observó que del total de los pacientes en hemodiálisis, 271 (13%), y en diálisis peritoneal 112 (5%) tuvieron mal control de la volemia, PCR elevada en el 64.4% y TSH > 10 UI/ml en el 12.1% de los sujetos. El índice tobillo-brazo (ITB) se encontró alterado en el 37.5% de los diabéticos, *versus* 21.8% en los no diabéticos (p<0.001); se observaron diferencias significativas en cuanto a sobrepeso, 40.03% *versus* 26.91%, en diabéticos y no diabéticos, respectivamente.

Conclusiones: Este modelo de gestión de enfermedad basado en gestoría de casos e integración de redes de servicios puede ser una respuesta de alto impacto para poblaciones en diálisis con importante comorbilidad.

Palabras clave: Factores de riesgo cardiovascular, Diálisis, Enfermedad renal crónica terminal, Gestión de enfermedad (fuente DeCS).

Introduction

Patients with Chronic Kidney Disease (CKD) indialysis therapy representa challenge for the health systems while the complexity of dialysis treatment and the base disease, joined a number of complications, especially cardiovascular origin[1] ; this condition suggests increased demand for services and therefore higher costs for the health care system.

High comorbidity inpatients on dialysis treatment, contributes to the presence of traditional cardiovascular risk factors, such as hypertension, diabetes, dyslipidemia, the disturbances in mineral metabolism, poor control of blood volume, and non-traditional or the so-called new risk factors such as chronic inflammation, endothelial dysfunction, augmented C-Reactive Protein (CRP), hyperhomocysteinaemia clinical and subclinical hypothyroidism[2-8] . In addition, the outlook is worsening for patients on dialysis treatment due to the greater presence of Peripheral Arterial Disease (PAD), associated with a high risk of coronary artery disease, cerebral-vascular accident and cardiovascular disease[9,10]. All of the above, especially cardiovascular diseases, lead to a significantly higher frequency of hospitalizations among this population[11,12].

Comprehensive strategy and cost efficient management models of disease have been proposed in response to the complexity of the care management that these patients require in order to achieve the best health outcomes[13-16]. In geographically dispersed populations where services received are not always integrated in their different levels of care; management models of disease could be complemented with the philosophy of the integrated networks of health systems, launched by the Pan American Health Organization (PAHO)[17] and the agency of cases, because these strategies that have already demonstrated their effectiveness[18-20]. In modern systems such as health, innovation in models that offer medical care in a more integral manner, more efficient and with excellent results for the patient and the society, become a way for improving living conditions of the populations.

This work aims to document the design of a model for disease management appliedto a population with chronic kidney disease (CKD) grade 5 on chronic dialysis and describe the cardiovascular risk factors and metabolic identified in these patients.

Methods

This management model of disease was designed based on a review of literature and the analysis of the annual clinical behavior of morbidity and mortality of the population reports on dialysis treatment, who belong to the health promotion entity (HPE) of the contributory regime, Nueva EPS®, and attended the network of Renal Therapy Services (RTS)®; the model in its three phases of implementation was described. A cross-sectional design for the characterization of the basal risk of patients was used; patients over 18 years old on chronic dialysis treatment with more than 90 days in therapy and with at least three months of permanence in RTS were sampled. The study was carried out during the period between

March 1st and August 31st, 2013. The demographic and clinical variables were obtained from the clinical history of RTS (RENIR®).

The variables considered for the analysis were: age, sex, time on dialysis, modality of dialysis, cause of the CRD, previous history of cardiovascular disease (CVD), body mass index (BMI), ankle arm index (AAI), cholesterol, albumin, hemoglobin, phosphorus, Kt/V, C-Reactive Protein, TSH, glycosylated hemoglobin (HbA1c); quality of dialysis, included in the account of high cost in Colombia[21], as were: albumin, hemoglobin, phosphorus, and Kt/v in HD and Kt/v in DP. Echocardiographic evaluation was conducted on the subgroup of patients with cardiovascular disease; the results were grouped as hypertensive heart disease, ischemic heart disease, valve disease, ejection fraction (EF) less than 50%, systolic pressure of the Pulmonary Artery (SPPA) greater than 25 mmHg and normal. Poor control of blood volume was defined clinically as a profit percentage inter-dialysis greater than 5% in patients on hemodialysis (HD) and as the sum of the ultrafiltration (UF) and dieresis less than 750 cc/day in patients on peritoneal dialysis treatment (PD). All the variables were taken at the beginning of the monitoring.

Medians and means with their respective measures of dispersion for continuous variables, in addition to percentages for categorical variables were used in the descriptive analysis. The statistical analysis was performed using STATA® 12. For all hypothesis tests, two queues and levels of significance of 5%were used. The implementation of the present study was approved and monitored by an institutional ethics committee.

Results

Description of the Model: The management model of disease was designed in 3 phases: 1) risk characterization, 2) intervention, evaluation and measurement of results and 3) management for continuous improvement. Every stageis composed of some specific activities that, on the whole, look for the identification and intervention on time of the main cardiovascular risk factors and metabolic diseases, in order to make an impact in the clinical outcomes defined as a reduction of events of hospitalization and hospital stays.

During the first phase, all patients receive information about interventions that they are going to receive, the expected benefits of the model, and information regarding their rights and duties as patients; as well as education on diabetes, information on handling and administering insulin, control of the blood volume and workshops about pharmacological adhesion. In a similar way, starts the identification of risk factors for stratification and prioritization of the interventions to be made in the next phase of the model.

In the second phase, the intervention of patients is carried out, according to the risk characterization; the model includes the specialized medical assessments of greater demand, as are endocrinology, cardiology and vascular surgery; during this phase the monitoring to the hospitalizations is carried out.

For the relevant implementation of this phase, the model considers some fundamental aspects such as: education of the patient and his family, the management of the clinical information and the integration of service networks. For the development of the model, case managers are drivers and guarantors. They become the integrative concept of networks of services, they manage the information related to the risk stratification of patients daily, the needs of referrals and references, events of hospitalization and requests for supplementary examinations outside of the renal unit as well; to achieve this they have automated tools of information that allow an agile process of monitoring and decision-making.

In the third phase, the results are analyzed and continuous improvement processes are implemented in order to achieve the proposed targets. Figure 1 outlines the MGE based on agency of cases and integration of networks of services.

Risk Characterization: 2219 patients that were attended were evaluated in 48 renal units in 13 departments of Colombia. Of these, 1306 (58.85%) were men, with average age of 62.93 (SD=14.7) years, 1267 patients (57.1%) were in HD at the beginning and 952 (42.9%) in DP, 1004 (45.24%) were dia-

betics, the median time in therapy at the start was greater for the non-diabetics: 4.75 (RIC=3.4) years, versus 2.61 (RIC=6.1) years. Table 1 describes the demographic and clinical characteristics at the beginning of the monitoring.

A subgroup of 1049 patients were assessed with an echocardiographic study and the following results were reported: 990 (94.37%) reported some alteration in the results. Among the patients, 172 (16.39%) presented with ischemic heart disease and 615 (58.62%) presented with hypertensive heart disease. In Table 2 we present the result of a echocardiographic; revealing discriminated findings because of the presence or not of diabetes.

In relation to other risk factors, it was found that a total of 271(13%) patients in HD had bad blood volume control and 112 (5%) in DP; the percentage of patients with ITB altered in diabetics versus non-diabetics was significantly different: 377 (37.54%), compared to 265 (21.81%), respectively, ($p<0.001$).Also significant differences as the proportions of patients with overweight: 402 (40.03%), against 3[27] (26.91%), between diabetic and non-diabetic patients, respectively were observed. The other risk factors compared did not show significant differences (see Table 3).

Discussion

The Management Model of disease in a population with CRD grade 5 in dialysis treatment described here has as foundation stones the agency of cases and the integration of service networks, and represents a solution in health for a population with important comorbidity, where almost half of the people suffer from diabetes mellitus and, about a third part of this population is documented as important cardiovascular disease. The management model of disease proposes the risk characterization as an integral strategy that allows you to prioritize interventions in order to achieve better results in health.

Figure 1.

Disease management model with agency of cases and integration of services networks

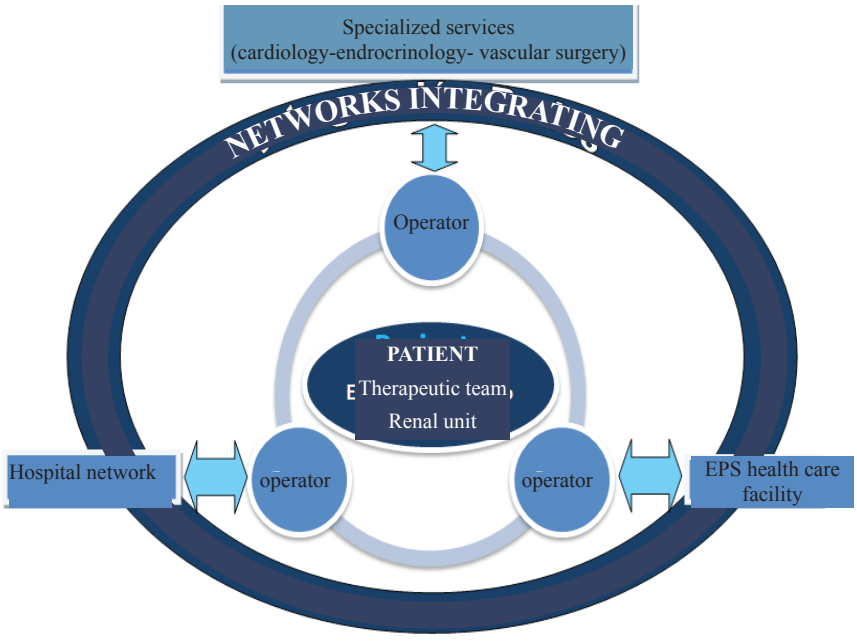

Table 1.

Demographic and clinical characteristics of patients at the start of the study taking into account the presence or not of diabetes.

Features	Diabetics	Non-diabetics (n 1215)	Total (n 2219)
Age [media;] in years	67(10.59)	60(16.7)	62.93(14.7)
Sex; men [n;%]	572(56.97)	734(60.41)	1306(58.85)
Time on dialysis [median;RIQ] years	2.61 (3.4)	4.75 (6.1)	3.55(5.53)
Modality; peritoneal dialysis [n;%]	486(48.40)	466(21.0)	952(42.9)
Vascular access [n;%]b			
Arteriovenous fistula	403(77.80)	575(76.77)	978(44.07)
Vascular Catheter	115(22.20)	174(23.23)	289(13.02)
Cause of the ERC [n;%]			
Arterial hypertension	76(7.56)	546(44.93)	622(28.03)
Diabetes	860(85.65)	—	860(38.75)
Glomerular disease	6(0.59)	186(15.30)	192(8.65)
Obstructive	12(1.19)	78(6.41)	90(0.40)
Unknown	24(2.39)	201(16.54)	225(10.13)
Other	26(2.58)	204(16.79)	230(10.36)
Body mass index [media;] in kg/m2	25.99(5.77)	23.73(4.22)	25(5.06)
Total cholesterol [media;] in mg/dl	181.80(53.63)	185.7(48.84)	184(51.07)
LDL cholesterol [media;] in mg/dl	101.79(43.22)	101.87(39.09)	105(41.34)
Albumin [media;DE] en mg/dl	3.79(0.56)	3.95(0.52)	4(0.54)
Hemoglobin [Medium;DE] en mg/dl	11.7(1.76)	11.62(1.84)	12(1.80)
Phosphorus [media;DE] en mg/dl	4.69(1.38)	4.72(1.57)	5(1.49)
Kt/v in peritoneal dialysis [media;DE]	2.22(0.61)	2.19(0.70)	2.2(0.66)
Kt/V in hemodialysis [media;DE]	1.50(0.37)	1.53(0.30)	1.52(0.33)
HbA1c [n;%] en %c			
HbA1c <= 6.5 %	321(32.26)	-	-
HbA1c > 6.5 y <= 7.5%	292(29.34)	-	-
HbA1c >7.5 y <=8%	121(12.16)	-	-
HbA1c >8%	261(26.23)	-	-
Background CVD [n;%]	359(35.75)	265(21.81)	624(28.12)

a To RIQ: Interquartile Range.

b available data in ahemo dialysis.

c glycosylated hemoglobin available for 995 diabetics.

Table 2.

Echocardiographic findings discriminated against by the presence or not of diabetes.

Finding	Diabetics (n 524)	Non-diabetics (n 525)	Total (n 1049)
Hypertensive heart disease [n;%]	306(58.39)	309(58.85)	615(58.62)
Ischemic heart disease [n;%]	106(20.22)	66(12.57)	172(16.39)
Mild to moderate valvular disease [n;%]	30(5.72)	60(11.42)	90(8.57)
Severe Valvular disease [n;%]	15(3.05)	29(5.52)	44(4.19)
Ejection fraction < 50% [n;%]	32(6.10)	28(5.33)	60(5.71)
PSAP>25mmHg [n;%]a	4(0.76)	5(0.72)	9(0.85)
Normal [n;%]	31(5.91)	28(5.33)	59(5.62)

a To systolic pressure of the pulmonary artery.

Table 3

Risk factors according to the presence or not of diabetes.

Risk Factors	Diabetics (n 1004)	Non-diabetics (n 1215)	P
Poorly controlled volémico [n;%]	150(14.94)	233(19.17)	0.20
C-reactive protein > 3 [n;%] mg/L	580(57.76)	719(59.17)	0.46
TSH>= 10 [n;%] en ml U/La	124(13.5)	121(9.95)	0.44
ITB <0.9 y > 1.4 [n;%]2	377(37.54)	265(21.81)	< 0.0001
IMC >= 30 kg/m2 [n;%]3	148(14.74)	87(7.16)	0.10
IMC >= 25 - 29.99 kg/m2 [n;%]3	402(40.03)	327(26.91)	< 0.0001
IMC < 18.5 kg/m2 [n;%]3	26(0.25)	88(7.24)	0.01
Total cholesterol >= 200mg/dl [n;%]	261(25.99)	356(29.30)	0.35
LDL cholesterol >= 100mg/dl [n;%]	345(34.36)	494(40.65)	0.06

A To TSH: Thyroid stimulating hormone.

B ITB:index ankle arm data available for 1730 patients.

C BMI: Body mass index.

Through comparisons inthe prevalence of risk factors among diabetics and non-diabetics significant differences in the ITB and BMI altered were observed, several studies have shown the greatest risk of cardiovascular complications in diabetic patients and the benefits of the comprehensive intervention22-24.In this regard, additional to metabolic control, actions such as the measurement of the ITB provide an opportunity for intervention against the risk of cardiovascular events25. On the other hand, the start or treatment adjustment to patients in whom TSH was found, it may benefit to avoid the appearance of atrial fibrillation, as some articles report.26.

Based on the trend of preventive care of the patient on dialysis treatment, the annual report in the United

States, United States Renal Data System (USRDS), in 2013 shows a 30% increase in taking echocardiograms in patient in dialysis treatment in the last decade[27]. It is important to highlight that in our population we found important and positive results in heart disease exactly in more than a third part of the patients; in addition, 93% of the cases identified some degree of abnormality; this percentage is higher than the one observed by other authors, as in the HEMO study that reported prevalence of heart disease in patients on HD 80%[28]. This data reinforced international recommendations to perform periodical echocardiograms to patients in dialysis treatment, given its increased cardiovascular risk and the high prevalence of heart disease in those patients.

The management model of disease based on agency of cases and integration of networks of services may be a high impact response to populations in dialysis with important comorbidity, this fact can turn into improved outcomes for patients and efficiencies for the health system. Subsequent studies assess the model in terms of clinical outcomes, costs and quality of life of the patients.

Conflict of Interest

Alfonso Bunch, Freddy Ardila, Stefano Laganis, Ricardo Castaño, Jasmin Vesga, Patricia Lopez and Mauritius Sanabria are employees of RTS Colombia. Layla Tamer is employed new EPS.

Contributions of the Authors

MS, FA AB and SL, LT, participated in the design, coordination of the study and in the statistical analysis and generation of the manuscript. JV, PL and RC were responsible for the data collection, statistical analysis and contributed to the design of the study and the consolidation of the manuscript. All authors approved the final manuscript.

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