

Aránzazu Sastre<sup>a,\*</sup>, Jose González-Arregoces<sup>a</sup>,  
Igor Romainoik<sup>a</sup>, Santiago Mariño<sup>a</sup>, Cristina Lucas<sup>a</sup>,  
Elena Monfá<sup>a</sup>, George Stefan<sup>a</sup>, Benjamin de León<sup>a</sup>,  
Mario Prieto<sup>a</sup>, Ana Maria Fernández Martínez<sup>b</sup>

<sup>a</sup> Servicio de Nefrología, Complejo Asistencial Universitario de León,  
León, Spain

<sup>b</sup> Servicio de Radiología, Complejo Asistencial Universitario de  
León, León, Spain

\*Corresponding author.

E-mail address: [aranchasastre@hotmail.com](mailto:aranchasastre@hotmail.com) (A. Sastre).

<http://dx.doi.org/10.1016/j.nefro.2017.01.020>

2013-2514/© 2016 Sociedad Española de Nefrología. Published  
by Elsevier España, S.L.U. This is an open access article  
under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Educating your patient is cost-effective: It reduces serum phosphate and saves €200 per patient per month<sup>☆</sup>

### Las estrategias de educación a pacientes son coste efectivas: reduzca el fósforo ahorrando 200 € al mes por paciente

Dear Editor,

In dialysis patients, there are only 3 mechanisms of phosphate control: (1) elimination of phosphate by dialysis, (2) chelating therapy, and (3) dietary restrictions. Phosphate elimination by dialysis has been shown to be useful but insufficient, while the other two mechanisms require patients to follow the prescribed treatment.<sup>1</sup>

Failure to follow treatment in chronic patients is very common, multifactorial and involves factors related to the patient, the disease, the health system and the medication itself.<sup>2</sup> Non-compliance with medication is even more striking with chelators, and is possibly the leading cause of lack of phosphate control.<sup>3,4</sup> Various studies show that phosphate control improves with educational strategies, improving adherence to dietary and medication recommendations.<sup>5-7</sup> Despite the high prices of new, more effective chelators, very few studies have addressed the economic aspects deriving from potential saving associated with improved compliance.

We want to determine whether educational activities improved compliance with medication and phosphate control and evaluate whether this is associated with a lower need for binders and savings in pharmaceutical expenditure.

In a population of haemodialysis and peritoneal dialysis patients, we measured the degree of phosphate control, the level of adherence to medication on 2 different scales (8-item Morisky and SMAQ),<sup>8,9</sup> knowledge about diet and treatment through a 6-item survey, the need for binders in each patient measured as the number of binders and dose prescribed of each binder (calcium carbonate/acetate, aluminium hydroxide, sevelamer hydrochloride/carbonate and lanthanum carbonate). The adherence using scales previously validated in chronic and dialysis patients. The scales classify

patients as compliant and non-compliant, and also provide values that allows to be used as a continuous variable, assigning a score for each of the items including questions asked in the form of the Likert scale. The Morisky scale assigns a higher score a better adherence, while the SMAQ scale assigns a lower score to a better the compliance.

We conducted an educational activity as workshop in which we addressed the clinical consequences of uncontrolled phosphate, identification of chelating medication, appropriate methods of administration, identification of foods with a high phosphate content and how to reduced their intake.<sup>10</sup>

Three months after, we re-measured all of the parameters mentioned. We collected data from 35 patients with a mean age of  $59.37 \pm 14.9$ , 18 on haemodialysis (HD) and 17 on peritoneal dialysis (PD), 43% female, 47% diabetic, with a time on dialysis of  $54.37 \pm 82.9$  months. The results of the study are shown in [Table 1](#). Phosphate levels were significantly reduced ( $5.0 \pm 1.5$  vs.  $4.4 \pm 1.4$ ). The percentage of patients with phosphate controlled rose from 40 to 71%. We observed no change in any other biochemical parameters except a negligible reduction in protein and albumin levels. The compliance with pharmacological treatment improved as measured by Morisky, as did the compliance of chelators measured by SMAQ. The number of errors in the knowledge test also improved significantly.

This improved control of phosphate led to a reduction in the number of binders and in the dose prescribed. The change in chelator dose and monthly expenditure is shown in [Table 2](#). The number of binders and the dose prescribed per patient was reduced especially in calcium and sevelamer binders. The monthly savings in the treatment of 35 patients was over 6000 euros, and with a better control of serum phosphate.

<sup>☆</sup> Please cite this article as: Rodríguez-Palomares JR, Japaz Cancino MC, Blazquez Collado L, Fiallos Criollo R, Villabon Ochoa PM, Sanchez Heras M, et al. Las estrategias de educación a pacientes son coste efectivas: reduzca el fósforo ahorrando 200 € al mes por paciente. *Nefrología*. 2017;37:103-105.

**Table 1 – Change in parameters after educational activity.**

Parameter	Pre-activity	Post-activity	Statistical significance
Patients	35		
Proteins	6.7 ± 0.5	6.53 ± 0.4	p < 0.05
Albumin	3.8 ± 0.3	3.73 ± 0.3	p < 0.05
Calcium	9.4 ± 0.6	9.2 ± 0.7	NS
Phosphate	5.0 ± 1.5	4.4 ± 1.4	p < 0.001
Percentage of controlled patients	40	77.1	–
PTH	395.2 ± 272.2	398.6 ± 74	NS
AP	94.3 ± 34.6	89.5 ± 31.2	NS
Vitamin D	18.7 ± 7.9	14.6 ± 4.3	NS
CRP	16.1 ± 26.7	11.9 ± 14.9	NS
KTV	2.2 ± 0.4	2.3 ± 0.4	NS
Morisky	6.3 ± 1.4	6.9 ± 1.2	p < 0.05
SMAQ-Q	0.95 ± 1.04	0.41 ± 0.48	p < 0.05
Known dietary errors	3.94 ± 1.2	2.42 ± 1.4	p < 0.001

**Table 2 – Changes in binders treatment after educational activity.**

Parameter	Pre-activity	Post-activity	Statistical significance
<b>Binders</b>	1.4 ± 1.0	1.1 ± 1.2	p < 0.05
Calcium: % pat. and g/wk	31.4	12.2 ± 9.2	25.7
Euros/month	182.92 €	160.52 €	
Aluminium: % pat. and g/wk	14.3	9.2 ± 6.0	20
Euros/month	36.72 €	71.12 €	
Sevelamer: % pat. and g/wk	48.6	42.5 ± 28.6	31.4
Euros/month	21,482 €	15,169.6 €	
Lanthanum: % pat. and g/wk	37.1	23.3 ± 13.1	37.1
Euros/month	3918.6 €	4053.0 €	
<b>Chelator cost</b>	25,619.64 €	19,454.24 €	6165.4 €

Patient education and therapeutic alliance in the prescription process are not only effective, but also cost-effective. To be effective educational strategies need to be uninterrupted. It is evident that educational activities directed to patients are needed; these activities should have a multidisciplinary approach including doctors, dietitians and nutritionists capable of planning and carrying out these training activities on an ongoing basis, is daily more evident. If educating just 35 patients produces a monthly saving of 6000 euros, how much could be saved by improving the education of all patients on chelation, diet, potassium, interdialytic weight gain, etc.?

## REFERENCES

- Arenas MD, Alvarez-Ude F, Torregrosa V, Gil MT, Carreton MA, Moledous A, et al. Consequences of the implementation of K/DOQI Clinical Practice Guidelines for Bone Metabolism and Disease in Chronic Kidney Disease in a population of patients on chronic hemodialysis. *J Nephrol.* 2007;20:453–61.
- Alkatheri AM, Alyousif SM, Alshabanah N, Albekairy AM, Alharbi S, Alhejaili FF, et al. Medication adherence among adult patients on hemodialysis. *Saudi J Kidney Dis Transpl.* 2014;25:762–8.
- Karamanidou C, Clatworthy J, Weinman J, Horne R. A systematic review of the prevalence and determinants of nonadherence to phosphate binding medication in patients with end-stage renal disease. *BMC Nephrol.* 2008;9:2.
- Covic A, Rastogi A. Hyperphosphatemia in patients with ESRD: assessing the current evidence linking outcomes with treatment adherence. *BMC Nephrol.* 2013;14:153.
- Karavetian M, de Vries N, Rizk R, Elzein H. Dietary educational interventions for management of hyperphosphatemia in hemodialysis patients: a systematic review and meta-analysis. *Nutr Rev.* 2014;72:471–82.
- Dolores Arenas M, Perez-Garcia R, Bennouna M, Blanco A, Mauricio O, Prados MD, et al. Improvement of therapeutic compliance in haemodialysis patients with poor phosphorus control and adherence to treatment with binders: COMQUELFOS study. *Nefrologia.* 2013;33:196–203 [Article in English, Spanish].
- Caldeira D, Amaral T, David C, Sampaio C. Educational strategies to reduce serum phosphorus in hyperphosphatemic patients with chronic kidney disease: systematic review with meta-analysis. *J Ren Nutr.* 2011;21:285–94.
- Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. *J Clin Hypertens (Greenwich).* 2008;10:348–54.
- Ortega Suarez FJ, Sanchez Plumed J, Perez Valentin MA, Pereira Palomo P, Munoz Cepeda MA, Lorenzo Aguiar D, et al. Validation on the simplified medication adherence questionnaire (SMAQ) in renal transplant patients on tacrolimus. *Nefrologia.* 2011;31:690–6 [Article in English, Spanish].
- Cupisti A, D'Alessandro C, Baldi R, Barsotti G. Dietary habits and counseling focused on phosphate intake in hemodialysis patients with hyperphosphatemia. *J Ren Nutr.* 2004;14:220–5.

José R. Rodríguez-Palomares<sup>a,b,\*</sup>,  
Maria Carmen Japaz Cancino<sup>c</sup>, Luis Blazquez Collado<sup>a</sup>,  
Ruth Fiallos Criollo<sup>a</sup>, Paola Milena Villabon Ochoa<sup>a</sup>,  
Marta Sanchez Heras<sup>a,b</sup>, Maria Angeles Basterrechea<sup>a</sup>,  
Gabriel de Arriba de la Fuente<sup>a,b</sup>

<sup>a</sup> Sección de Nefrología, Hospital Universitario Guadalajara,  
Guadalajara, Spain

<sup>b</sup> Departamento de Medicina, Universidad de Alcalá de Henares,  
Alcalá de Henares, Madrid, Spain

<sup>c</sup> Unidad de Nefrología y Hemodiálisis, Clínica Fuensanta, Madrid,  
Spain

\*Corresponding author.

E-mail address: [athelas36@gmail.com](mailto:athelas36@gmail.com)  
(J.R. Rodríguez-Palomares).

<http://dx.doi.org/10.1016/j.nefro.2017.01.025>

2013-2514/© 2016 Sociedad Española de Nefrología. Published  
by Elsevier España, S.L.U. This is an open access article  
under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## ANCA-negative idiopathic pulmonary fibrosis developed into ANCA-positive rapidly progressive glomerulonephritis after 12 years follow up

### Fibrosis pulmonar idiopática ANCA negativa desarrollada en la glomerulonefritis de evolución rápida en ANCA positiva después de 12 años de seguimiento

Dear Editor,

Idiopathic pulmonary fibrosis (IPF) is a chronic, progressive fibrotic disorder of the lung parenchyma. Rapidly progressive glomerulonephritis (RPGN) is a disease characterized by acute loss of renal function with glomerulonephritis, which is diagnosed by a pathologic pattern of crescent formation. A subgroup of RPGN is associated with anti-neutrophil cytoplasmic antibodies (ANCA). ANCA are abnormal auto-antibodies which are particularly related to small-vessel vasculitis in the kidneys. The perinuclear (p-ANCA) and cytoplasmic (c-ANCA) immunofluorescent patterns mainly correspond to antibodies directed against myeloperoxidase (MPO) and proteinase-3 (PR3), respectively. Herein, we report a case of a 37-year-old man with a history of ANCA (–) IPF who abruptly developed ANCA (+) RPGN with pulmonary renal syndrome after 12.5 years.

A 37-year-old man had a history of ANCA (–) IPF and gouty arthritis under control with prednisolone 5 mg QOD and colchicines 0.5 mg QD for over 12.5 years. A month prior to presentation, he began to experience intermittent muscle aches, arthralgias over bilateral hands and foamy urine. He finally presented to the emergency department with complaints of progressive shortness of breath, hemoptysis, poor urine output, and bilateral lower leg edema for one week. The physical examination was notable for respiratory discomfort, bilateral rales and grade 1 pitting edema of bilateral lower limbs. No petechiae, ecchymosis or costovertebral angle

tenderness were noted. Blood tests showed leukocytosis, azotemia (BUN: 159 mg/dL, creatinine: 21.1 mg/dL), hyperkalemia, and anion gap metabolic acidosis. Urinalysis revealed proteinuria and hematuria. Immunologic studies showed mildly decreased C3 (76.5 mg/dL, reference range: 90–180 mg/dL) and positive MPO-ANCA (28 IU/ml, reference range: negative <3.5, positive >5 IU/ml). Chest X-ray showed infiltrates in both lungs. Non-contrast computed tomography of the chest showed interstitial reticular fibrotic infiltration with honeycomb appearance of bilateral lungs and consolidation in the left lung zone. Renal ultrasonography demonstrated normal-sized kidneys with increased cortical echogenicity. Ultrasound-guided renal biopsy was performed and revealed a proliferative glomerulonephritis with sclerosis and crescentic formation (Fig. 1). Immunofluorescent microscopy of the glomeruli was negative for staining of IgA, IgG, IgM, C1 and C3. Based on the above-mentioned examination results and clinical manifestations, severe MPO-ANCA (+) RPGN with pulmonary-renal syndrome was diagnosed. During the initial admission, emergent hemodialysis and plasmapheresis (5 sessions) were performed. Immunosuppressant therapy including pulse steroids (methylprednisolone 500 mg daily for 6 days) followed by oral prednisolone (5 mg BID) and azathioprine (50 mg daily) and targeted therapy with rituximab (total 3 g over 3 divided fractions) were also added. Nonetheless, high ANCA titers and poor renal function persisted so immunosuppression therapy and hemodialysis were