



# ENFERMERÍA NEFROLÓGICA

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Kidney disease: 50 years in the making

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Evolution of urea levels with the implementation of an intradialytic physical exercise program

Depression, anxiety, and stress in people on renal replacement therapy from the City of Chihuahua

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Analysis of an alternative technique for exit site culture in peritoneal dialysis catheters using pediatric blood culture bottles

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# Premios Íñigo Álvarez de Toledo

## *de Investigación en Nefrología*

### Enfermería nefrológica



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# Kidney disease: 50 years in the making

Itziar Bueno-Zamarbide

President of the Spanish Society of Nephrology Nursing

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## Dear SEDEN,

It is beautiful to look back and see the path you have traveled over these years, long or short, depending on how you look at them and how they are lived.

Because, although they may have passed like a breath since that first nursing society founded in our country in 1975, the history of SEDEN has been lived and grown intensely and with great achievements.

Surely Jandry Lorenzo and Rosa Lavari, who led the first meeting held at the Hotel Ercilla in Bilbao (Basque Country, Spain) did not suspect that 50 years later, thousands of nurses would join this society as an unmistakable sign that those always responsible for the management of kidney patients had, and have, the need to meet, listen to each other, and understand each other.

The essential excellence in care, the sharing of experience, the investigative spirit, the improvement in the management of our services, the concern for the promotion of knowledge, and the dissemination of the best available evidence associated with digital evolution, has been and continues to be our unwavering roadmap. A roadmap that we unfold with a firm step, not without difficult and complicated moments.

Difficult moments surely remembered by the individuals who have held the Presidency and successive boards of directors, for whom SEDEN will always hold its memory and gratitude.

And of course, the history of SEDEN would not be the same without the advice, guidance, and work of the Editorial

Committee, that tireless companion who works year after year to make visible and disseminate the best evidence in nephrology nursing.

We are a living society, rich in knowledge, numerous in members, diverse in models and initiatives, open to the world, enjoying good internal and external health; and one that opens its doors so that the younger generations of nurses come to learn and contribute to this project that is the work of all.

Although it is my intention not to name anyone specifically so that no one is forgotten, allow me in this editorial to have a special remembrance for the two entities with which we feel most closely linked: our patients, ALCER, the reason for our attention, and S.E.N., our nephrologists and colleagues in the daily work, in the specialty, and in the work teams. Both societies are our inseparable travel companions in the task of caring for our renal patients and doing so with the best quality and resolution.

In addition to this, the agreements that SEDEN has formalized with different scientific societies and entities, nursing or not, facilitate our participation and collaboration in all those initiatives and programs that we launch.

It is our mission to emphasize that the constancy, effort, and dedication of those first meetings were a path for many people who came after, who gave their time and continue to do so with the conviction of the importance of nursing care alongside the patient; who continue to fight for this profession, this specialty, and the knowledge that sustains them to be officially and justly recognized.

The current increase in the incidence and prevalence of chronic kidney disease, along with the aging population, the presence of social and cultural diversity in our citizenry, and the change in family structures, propose a change in vision, attitude, and provision of care. Currently, it is a reality that SEDEN is an active and indisputable part in the design of a new strategy for chronic kidney disease led by the Spanish Ministry of Health, and we congratulate ourselves for this.

Nephrology nursing faces, in the immediate future, the challenge of moving beyond the hospital walls. It is time to reach out to our patients' homes and healthcare centers to provide the care that we are competent to provide.

We are a facilitating profession with strong values. Closeness, active listening, accompaniment, adequate information, education, and interaction with the patient and their environment are, in themselves, indispensable, indelibly etched in our professional DNA. We are human, or we are not.

I end this editorial by recalling Seneca's phrase that Jandry pronounced at the first SEDEN meeting: "If a man knows not to which port we are steering, no wind will be favorable." Fortunately, SEDEN, and nephrology nursing, have a clear objective: a shared path, in which everyone fits, welcoming and professionally solid and ambitious.

From this presidency, on my behalf and on behalf of the Board of Directors, I congratulate you, SEDEN, and we will join you to celebrate our 50<sup>th</sup> anniversary in Oviedo (Asturias, Spain).

**For many more years, congratulations!**

## REFERENCES

1. Sociedad Española de Enfermería Nefrológica. Madrid. [cited 25 Jan 2025]. Available at: <https://www.seden.org>



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# Home care in people on hemodialysis emphasizing diet and vascular access

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## ABSTRACT

**Introduction:** People on hemodialysis must take daily care of their vascular access, adhere to diet and fluid restrictions. However, there are few qualitative studies on this.

**Objective:** To analyze home care in people on hemodialysis, emphasizing diet and vascular access.

**Material and Method:** We conducted a qualitative, descriptive, exploratory, and interpretive study, where 12 people on hemodialysis at the Northern Kidney Center in Peru participated, with convenience sampling. The sample size was obtained by the criterion of saturation and redundancy. A semi-structured interview validated by expert judgment was used to collect the data, which were processed according to thematic content analysis.

**Results:** a) New eating habits to comply with dietary regimen, b) Strategies to comply with fluid regimen and thirst control, c) Care of vascular access in their daily life.

**Conclusions:** It has been identified that people on hemodialysis, with the support of their families, follow the recommendations of health professionals regarding dietary and fluid restrictions, meticulous care of their vascular access in terms of body hygiene and rest. However, aspects that require improvement through personalized education are identified, especially when they avoid eating at night to control weight, eating out in restaurants or at family gatherings, where the prescribed diet is not followed.

**Keywords:** renal dialysis; home health care; housing; caregivers; qualitative research.

## RESUMEN

**Cuidados en el hogar en personas sujetas a hemodiálisis enfatizando la dieta y el acceso vascular**

**Introducción:** Las personas que reciben hemodiálisis deben cuidar diariamente su acceso vascular, cumplir con la dieta y restricción de líquidos, pero existen escasos estudios cualitativos sobre ello.

**Objetivo:** Analizar los cuidados en el hogar en personas sujetas a hemodiálisis enfatizando la dieta y el acceso vascular.

**Material y Método:** Estudio con enfoque cualitativo, descriptivo, exploratorio e interpretativo, donde participaron 12 personas que reciben tratamiento de hemodiálisis en el Centro del Riñón del Norte en Perú, con muestreo por conveniencia y el tamaño de la muestra se obtuvo por el criterio de saturación y redundancia. Para recolectar los datos se usó una entrevista semiestructurada validada por juicio de expertos. Los datos fueron procesados según el análisis de contenido temático.

**Resultados:** a) Nuevos hábitos alimentarios para cumplir régimen dietético, b) Estrategias para cumplir régimen hídrico y control de la sed, c) Cuidados con el acceso vascular en su vida cotidiana.

**Conclusiones:** Se ha identificado que las personas en hemodiálisis, con el apoyo de sus familias, siguen las recomendaciones de los profesionales de la salud en cuanto a las restricciones alimentarias, de líquidos, el cuidado meticuloso de su acceso vascular en lo que respecta a la higiene corporal y al descanso. No obstante, se identifican aspectos que requieren mejoras a través de una educación personalizada, sobre todo cuando evitan comer por la noche para controlar el peso, comer fuera de casa en restaurantes o en reuniones familiares, donde no se sigue la dieta prescrita.

**Palabras clave:** diálisis renal; atención domiciliaria de salud; vivienda; cuidadores; investigación cualitativa.

## INTRODUCTION

Chronic kidney disease (CKD) is a progressive disease that affects more than 800 million people worldwide; its treatment is costly and impacts the economy of the State, the patient, and their family<sup>1</sup>. When CKD progresses, these individuals require lifelong renal replacement therapy to survive, and hemodialysis (HD) is the most common modality. People receiving HD must follow a rather complex treatment regimen that includes dietary and fluid restrictions, attending HD sessions of three to four hours three times a week, caring for their vascular access (VA), and adhering to pharmacological treatment<sup>2</sup>.

Despite recognizing the importance of self-care at home, they have difficulties complying with the strict fluid and food intake regimen, and they neglect themselves by indulging in "cravings" in their meals<sup>3,4</sup>. Similarly, after HD treatment, vascular access care must continue at home, and in the case of the central venous catheter, the dressing must be kept clean and dry to avoid infections, since the success or failure of their treatment depends on it<sup>5,6</sup>. Furthermore, non-compliance with these instructions significantly increases their hospitalization and mortality<sup>7</sup>. Hence, the importance of understanding how they take care of themselves at home.

In this regard, a study in Korea<sup>8</sup> revealed that people on HD take care of their fluid intake, but this restriction is the greatest stress factor they experience. In China<sup>9</sup>, they concluded that fluid restrictions and lack of emotional management are the aspects that most affect people on HD. In Palestine<sup>10</sup> and Cuba<sup>2</sup>, people on HD recognize that it is very complicated to comply with fluid and diet restrictions. Meanwhile, in Peru<sup>11</sup>, they report that people on HD comply with vascular access cleaning, avoid lifting weight with their VA-bearing arm, and protect their catheter when showering.

The effectiveness of hemodialysis is intrinsically linked to commitment to compliance with nutritional guidelines, fluid control, and meticulous vascular access care<sup>12,13</sup>. Therefore,

it is essential to explore this practice from the perspective of the experiences of people on HD, in whom the knowledge gap of qualitative studies is evident, so that health personnel, especially nurses, can offer education and follow-up tailored to each individual to prevent complications. In response, the objective was formulated to analyze home care in people undergoing HD, emphasizing diet and VA.

## MATERIAL Y METHOD

Given that the topic is novel and there are few qualitative studies available, a study with a qualitative approach, descriptive, exploratory, and interpretive design<sup>14</sup> was carried out, detailing a reality, delving into a little-researched area, to intuit the experiences of the participants about home care related to diet and VA carried out by people on HD treatment.

The population consisted of 80 people on HD at the private institution Centro del Riñón del Norte S.A.C., located in the department of Lambayeque, district, and province of Chiclayo. Adults with a minimum of 3 months on HD were included, and those who had difficulty communicating verbally and those who did not wish to participate in the study were excluded. The sample was non-probabilistic for convenience. And the sample size was reached with 12 people on HD, determined by the saturation and redundancy criterion, that is, when the interviewees' discourses became repetitive and did not provide interesting data related to the object of study.

Of the total people on HD interviewed, 9 are men and 3 women, aged between 25 and 66 years. Regarding the educational level, 4 have incomplete primary education, 4 incomplete secondary education, 3 complete secondary education, and only one patient had technological higher education. Four come from the high Andean area of the Lambayeque region, three are from the Chiclayo district, two from Cajamarca, two from Amazonas, and one from Piura.

These sociodemographic characteristics may influence the study results, since most of them have incomplete studies and therefore some difficulty in understanding the indications of health personnel about their self-care related to food and fluid intake. Similarly, most come from different Andean regions, where food customs and travel to the city for treatment cause them to fail to comply with the diet.

Data were collected through semi-structured interviews<sup>14</sup>, validated by three experts in qualitative research and the subject matter, to ensure the congruence of the questions with the object of study and improve their wording. The instrument contains general patient data and open questions related to the object of study: How do you comply with the dietary and fluid regimen at home? When you are thirsty, how do you control the fluids you drink? How do you know you are overweight (what do you feel) and how do you take care not to gain weight? How do you take care of your vascular access during the day, when you bathe, and when you sleep?

The interviews were conducted in September and October 2023. The place, date, and time of the interview were according to their preference and availability; eight interviews were conducted in the nursing topic of said institution, and four interviews were conducted in their homes, lasting approximately 20 minutes, and a voice recorder was used, with prior informed consent. It is worth mentioning that even having collected the data in two contexts (clinic and home), the interviews were conducted preserving privacy, with trust and empathy, so that, in both scenarios, the interviewees answered the questions easily and naturally.

Afterward, each interview was transcribed into a Word document and sent via WhatsApp for the interviewees to confirm the data. It should be noted that the audios will be kept for two years in case of an audit, complying with the scientific rigor criterion of credibility<sup>14</sup>.

After the interviews were conducted, data were processed and analyzed manually, through thematic content analysis<sup>15</sup>, including 3 phases: 1) pre-analysis, the collected data were transcribed and organized. Then, the information strictly related to the object of study was read and selected. Similarly, aspects not related to the research were eliminated; 2) coding, ideas and concepts were fragmented into a word or short phrase that represents the units of meaning, to favor the reduction of data, 15 codes were obtained; and 3) categorization, the codes were ordered and classified by similarity in their content, emerging three categories.

Among the ethical aspects, voluntary participation in the study was guaranteed through informed consent. To protect participant confidentiality, codes were assigned (OS1, OS2... OS12). Likewise, this study was carried out with the prior approval of the Ethics and Research Committee of the Faculty of Medicine of Universidad Católica Santo Toribio de Mogrovejo with resolution N° 251-2023-USAT-FMED and the authorization of Centro del Riñón del Norte S.A.C.

## RESULTS

After data processing, the following categories were obtained, which are illustrated with the most significant discourses that reflected the experiences of the study subjects.

### a) New eating habits to comply with the dietary regimen

People on HD have modified their eating habits to comply with a strict diet, mostly prepared by a family member. They have adopted a low-salt diet without intense flavors, even eliminating certain foods such as legumes or corn. They avoid consuming foods high in salt, sugar, dairy, coffee, and certain fruits. Some choose not to have dinner to control their weight. However, some patients face difficulties following dietary recommendations due to living alone or residing far from the hemodialysis center, which leads them to occasionally eat in restaurants or consume prohibited foods at family gatherings or social events, such as duck or pork, causing them digestive problems like diarrhea. Despite recognizing the sacrifice

involved in complying with the diet, they resign themselves and abide by it. As described below:

*"My mom makes the diet they tell me, or sometimes I cook, everything is very low in salt, and we also dialyze the food, for example: if it's stew, I soak it, and throw away the water when it boils, then I add more water, and that's how it cooks... I avoid salted mackerel, for me it's poison, milk, coffee, mango, pitahaya, or plum because they give me diarrhea, it's a sacrifice to follow this diet, but I have no other choice..." OS5*

*"Mostly I cook, everything is low in salt... I dialyze the stews, I blend the garlic with a little salt, when I make my dressings I no longer add salt to the chicken pieces, rice, I don't add tomato to my dressings because they tell me it's harmful to me, I only eat the portion they give me, I drink chamomile or anise in sugar-free infusion..." OS11*

*"My daughter cooks everything low in salt... for breakfast, sugar-free oatmeal and corn, for lunch, rice scrambled eggs with lemonade soda, and sometimes at dinner, I feel heavy and don't have dinner, I just drink chamomile so I don't gain weight..." OS6*

*"The day I don't get dialyzed, I cook, I add very little salt to the food, I avoid eating salted fish, star fruit, and chocolate because it gives me diarrhea... but when I have birthdays, I eat pork or duck there because there is nothing else to eat..." OS4*

*"They eat differently here, it's not like at my house, I'm from Amazonas. Sometimes I eat at the restaurant when I leave hemodialysis, but it gives me diarrhea, so I prepare my food or my neighbor invites me... I don't have dinner anymore because I carry a lot of weight..." OS10*

*"I avoid salted mackerel, mango, pitahaya, or plum because they give me uncontrollable diarrhea... when I'm at home, I take care of my food, but when I go to my mom's house I mess up, she serves me a lot, and it makes me sad to disappoint her..." OS8*

### b) Strategies to comply with the fluid regimen and thirst control

On the other hand, people on HD use various strategies to manage the feeling of thirst they experience. When they feel thirsty, they resort to practices such as drinking warm or cold water with a little sugar-free lemon, sucking on ice cubes, gargling, or chewing ice from lemon candies. Some choose to consume juicy fruits such as pears, limes, or cucumbers to quench their thirst. Others seek to stay busy to distract themselves and avoid the temptation to drink excess water. They recognize that fluid intake control is crucial to avoid weight gain and the feeling of bloating. As they narrate below:

*"I drink half a glass of very cold water... if I'm very thirsty, I put ice cubes in my mouth, and it quenches my thirst, I try to stay busy, and that way I don't think about drinking water... I avoid foods with a lot of water because my eyes, face, hands, and feet swell, my legs hurt, and I did gain weight..." OS1*



*"I have cold water in my jug, I gargle up to three times, and I play with the water in my mouth until the water gets warm and I spit it out, then I take a sip of water, and it goes away... or I keep myself busy so I don't think about thirst..." OS10*

*"I put a lemon candy in a glass of water, then I put it in the refrigerator to freeze, I suck on that ice, and I keep it like playing in my mouth until my thirst goes away... when I work or get distracted, I forget I'm thirsty..." OS12*

*"When I'm thirsty, I drink warm water with half a lemon cap, and I take small sips with a spoon... or I eat a pear, a lime, or a cucumber, and it calms my thirst... I try to maintain my weight, when I carried too much weight, I felt agitated, my feet swelled, and my head was bursting with pain..." OS9*

*"I try to maintain my weight and drink little water, because when I swell, the headache is unbearable..." OS5*

### c) Vascular access care in their daily life

All people on HD diligently care for their VA, avoid forced exercises on the carrier arm, or use gloves or long-sleeved clothing when leaving home. During sleep, they adopt supine, right, or left lateral positions, being careful not to compress or damage the fistula. In addition, they monitor the normal functioning of their VA, recognizing it by a sound similar to a vibrator, calling it a "motor." To prevent hematomas or scars, some apply creams like Ubresan®. And they are cautious during bathing, covering their VA with cloths, plastic bags, adhesive bandages, or a family member assists them in their hygiene to prevent the dressings from getting wet.

As they describe:

*"I wear a shirt up to my elbow so it doesn't show that I have a fistula, I always touch the little motor of my fistula, which should be very electric... I don't do hard work, I don't lift weight... when I sleep, I lie down straight so I don't crush it" OS10*

*"I limit doing force with the arm where my fistula is, and I sell it so I don't hit it... I also apply Ubresan so it doesn't leave a scar... at night I sleep with my hand crossed on my chest" OS1*

*"I keep my arm nice, I apply Ubresan so it doesn't leave a scar... To sleep, at first I had difficulty, the little motor of my arm moved by itself due to the vibration, and I try to sleep on my back and not let my bed hit the fistula" OS9*

*"When I have pain in my fistula, I put aloe vera leaf on it, I previously remove the iodine, leave it in water for a few hours, and apply it to my fistula. I lie on my right side to sleep and not touch my fistula..." OS3*

*"During the day I work in my workshop and avoid doing force with my arm that has the catheter... I cover my catheter with a bag, and I bathe by pouring water with a jug or I ask my family member to help me. Sometimes I wipe a damp cloth on my neck, shoulders, down to my waist to avoid wetting my catheter" OS6*

*"With a clean cloth and packing tape I stick to the contour of my catheter, first I wash my head with running water, then I call my daughter to rub my back with soap and I rinse myself, but even if the gauze of my catheter gets wet, I change it, first I put alcohol on my hands and place dry gauze and fix it with adhesive bandage..." OS4*

*"I bathe with a jug, first I wash my head, I wrap my head with a towel, and I continue with my body without wetting my catheter..." OS12*

## DISCUSSION

In this study, people on HD highlight the difficulty of incorporating new habits to address the recommended diet, but they recognize the importance for their well-being. The family plays a fundamental role in the preparation of this diet, promoting the reduction of salt use, dialysis of certain foods, consumption of cooked egg whites, soy drinks, or sugar-free infusions. However, there are also inappropriate behaviors, such as skipping dinner to avoid gaining weight, not following the diet at family gatherings, or eating out in places where there is no specific option for them. When feeling hungry, many do not consider the potential risk to their health. Therefore, it is recommended that nursing and nutrition personnel continuously monitor dietary compliance, to raise awareness among patients and their families.

Results similar to the study by Fuentes et al<sup>16</sup>, where people on HD treatment modify their lifestyles, especially restricting the consumption of fish, dairy, sausages, and dialyzing food, a technique that consists of soaking legumes and tubers for 24 hours to reduce mineral content. However, other participants tend to eat everything and do not control themselves. In contrast, Kim and Lee<sup>17</sup>, express that some people on HD use a small plate and chopsticks instead of a spoon to reduce their food intake, and exclude prohibited foods. And Hwang et al<sup>18</sup> showed that participants with normal blood results reported restricted food intake, avoided eating out, processed foods, raw fish, and did not skip meals.

To regulate fluid intake, they adopted certain habits such as drinking half a cup of cold or hot water with sugar-free lemon, sucking on ice cubes or frozen lemon candies. Some participants preferred to consume pears, limes, or cucumbers to quench their thirst, and they strive to stay busy to distract themselves from the feeling of thirst. They recognized that lack of control in fluid intake could trigger symptoms such as tachycardia and swelling in eyelids, face, hands, and feet, resulting in weight gain.

These results are similar to the study by Kim and Lee<sup>17</sup>, highlighting that hemodialysis patients drank water only when they wanted it gradually, very slowly, and used a straw. When the water was in their mouth, they held it before spitting it out. Then they repeated this process, never swallowing the water. They also did outdoor activities to distract themselves and suppress thirst. In addition, Vijay and Kaur<sup>19</sup> concluded



that non-compliance with fluid restrictions is highly prevalent among HD patients, causing them fluid overload in the interdialytic phase and the accumulation of metabolic waste that limits the benefits of HD<sup>20</sup>.

Of note, the study participants' families are aware and monitor compliance with the indicated intake of food, fluids, weight control, and reduced salt consumption. As can be seen in the aforementioned studies, in different parts of the world people receiving hemodialysis have the same indications, but according to their customs, habits, and available foods, they adapt to the recommendations of health personnel, acquiring some particular strategies to comply with the imposed restrictions, it is necessary that they comply because the success of this treatment depends on it. In this regard, Özkan and Taylan<sup>13</sup>, recommend that there be individualized counseling on diet and fluid restriction, considering the cultural environment, barriers, or difficulties of each person on HD.

This study shows that people on HD are very careful with their VA, for which they follow some routines for their daily protection, avoid activities that cause them to use force, use bandages or an elbow pad for fear of hitting the arm where they have the VA, they check the vibration of the VA. They also adapt some sleeping positions and do not compress their VA. Sometimes they receive family support to perform their body hygiene and are very careful when handling it. This is because the personnel who hemodialyze them indicate the daily routine of self-care practices so that they maintain a clean and protected access<sup>21</sup>. Fernández et al<sup>22</sup>, reports that learning to shower with the VA awakened restlessness and impotence in people on HD who were used to exercising self-care, which increased the feeling of loss of control over their body.

In view of the above, it is suggested that nursing personnel continuously supervise people on HD on compliance with the diet, fluid regimen, vascular access care, and even pharmacological treatment, resorting to telenursing, to prevent intra- and post-dialytic complications, which can be detected through the results of monthly laboratory tests of each patient. Likewise, it is proposed to provide information through brochures or exclusive guides for home care, encouraging the participation of both the person on HD and their family caregiver.

We should also mention that it would be valuable to explore in future research the opinion of the family caregiver and nursing staff to triangulate the information.

In conclusion, the family caregiver is a fundamental pillar for home care and compliance with health recommendations for people on HD. Changes in eating habits were observed, where most receive help from their families to prepare the diet, low in salt and without intense flavors, and modifying certain foods. However, some people on HD skip dinner to control their weight or have difficulty following dietary indications when eating out, or when they come from other cities because

they eat in restaurants and do not follow the diet, which can compromise their health.

Regarding fluid control, they resort to methods such as drinking water with sugar-free lemon or consuming juicy fruits, but they recognize that lack of control can trigger symptoms such as tachycardia and fluid retention.

In addition, meticulous vascular access care is evident, implementing protection measures during sleep and personal hygiene, avoiding activities that require effort and using bandages or elbow pads to prevent arm injuries.

## Conflicts of interest

The authors declare no conflicts of interest related to the research, authorship, and/or publication of this manuscript.

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# AWARD

## Donation and Transplant

Sponsored by the Spanish Society of Nephrology Nursing (SEDEN) with the goal of stimulating the work of professionals in this field, the 9<sup>th</sup> edition of the Donation and Transplant Award is announced under the following:

- All works submitted to the 50<sup>th</sup> National SEDEN Congress related to the field of kidney transplantation are eligible.
- Submissions must be written in Spanish.
- Works must be unpublished and comply with all submission guidelines for the 50<sup>th</sup> National SEDEN Congress.
- The submission deadline will be the same as that established for other submissions to the 2025 SEDEN Congress.
- The jury will consist of the SEDEN Scientific Committee for Abstract Evaluation.
- The award will be presented during the inaugural session of the 50<sup>th</sup> National SEDEN Congress (2025).
- The winning work will be made available to the *Enfermería Nefrológica* journal for possible publication, at the discretion of the editorial committee. Authors must cite the work's origin as a SEDEN Award if using or publishing it later.
- To receive the award, the work must be presented at the 50<sup>th</sup> SEDEN Congress, and the presenter must be one of the listed authors. Presentations by individuals not involved in the authorship will not be accepted.
- Any unforeseen circumstances will be resolved by the SEDEN Board of Directors.
- Award: Free registration to the 2026 National SEDEN Congress.
- The award may be declared void.

\* The monetary award is subject to tax withholding.



# Evolution of urea levels with the implementation of an intradialytic physical exercise program

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## ABSTRACT

**Introducción:** The kidneys of patients with chronic kidney disease cannot adequately filter and eliminate urea. High levels of this molecule are harmful to their health. There is evidence that exercise helps eliminate urea during hemodialysis.

**Objective:** To describe the evolution of urea levels over time when performing a low-intensity aerobic physical exercise program in hemodialysis patients.

**Material and Method:** We conducted a longitudinal quasi-experimental study with 10 patients, in whom an aerobic exercise program was applied for 14 weeks. Urea levels were recorded before and after hemodialysis with blood urea nitrogen analysis.

**Results:** A decrease in urea levels from 107.58 down to 79.34 mg/dl (men) and from 82.09 to 56.40 mg/dl (women) was observed in pre-exercise blood urea nitrogen analyses between weeks 0 and 14 of the exercise program ( $p = 0.022$ ).

**Conclusions:** Performing an aerobic physical exercise program while on hemodialysis is related to a decrease in pre- and post-hemodialysis urea levels over time. Therefore, the implementation of aerobic physical exercise could be related to an increase in urea clearance in patients with chronic kidney disease.

**Keywords:** chronic kidney disease; hemodialysis; aerobic exercise; urea.

## RESUMEN

**Evolución de los niveles de urea con la implementación de un programa de ejercicio físico intradiálisis**

**Introducción:** Los riñones de pacientes con enfermedad renal crónica no pueden filtrar y eliminar adecuadamente la urea. Niveles altos de esta molécula son perjudiciales para su salud. Existe evidencia de que el ejercicio ayuda a eliminar la urea durante la hemodiálisis.

**Objetivo:** Describir la evolución de los niveles de urea en el tiempo al realizar un programa de ejercicio físico aeróbico de baja intensidad en pacientes en hemodiálisis.

**Material y Método:** Estudio cuasi experimental longitudinal con 10 pacientes, en quienes se aplicó un programa de ejercicio aeróbico durante 14 semanas. Se registraron los niveles de urea antes y después de la hemodiálisis con análisis de nitrógeno ureico en sangre.

**Resultados:** Se observó una disminución en los niveles de urea de 107,58 a 79,34 mg/dl (hombres) y de 82,09 a 56,40 mg/dl (mujeres) en los análisis de nitrógeno ureico en sangre pre ejercicio entre las semanas 0 y 14 del programa de ejercicio ( $p=0,022$ ).

**Conclusiones:** Realizar un programa de ejercicio físico aeróbico durante la sesión de hemodiálisis se relaciona con una disminución de los niveles de urea pre y post hemodiálisis a lo largo del tiempo. Por tanto, la implementación de ejercicio físico aeróbico podría estar relacionado con un aumento en la depuración de urea en pacientes con enfermedad renal crónica.

**Palabras clave:** enfermedad renal crónica; hemodiálisis; ejercicio aeróbico; urea.

## INTRODUCTION

Chronic kidney disease (CKD) represents a serious health issue worldwide. In Mexico, it has a prevalence of 9,184.9 cases per 100,000 inhabitants, according to the most recent data from 2021<sup>1,2</sup>. This disease poses public health challenges and generates significant economic repercussions due to the high costs associated with treatment for affected patients<sup>3</sup>.

High urea levels in patients with CKD have been shown to be associated with increased mortality, heart problems, and complications such as weakness, anorexia, vomiting, hypothermia, or uremic syndrome<sup>4-6</sup>. Urea levels can be measured through various tests. One of them is the blood urea nitrogen (BUN) test, which is used to assess kidney function by measuring the amount of urea in the blood<sup>7</sup>. Pre-BUN tests are taken before the hemodialysis session, while post-BUN tests are collected afterward to assess treatment effectiveness.

Current evidence suggests that exercising during hemodialysis sessions contributes to the reduction of urea levels. This could be due to the increased blood flow to low-perfusion tissues, such as muscle, which may enhance urea clearance<sup>8</sup>. In fact, combining aerobic and resistance training during hemodialysis has been shown to increase muscular blood flow. This may facilitate the transport of urea and toxins from tissues to the vascular compartment, thereby improving the effectiveness of the hemodialysis process<sup>9</sup>.

Physical activity also leads to greater diffusion of urea from tissue to plasma and thus increases the effectiveness of hemodialysis. It has also been suggested that maintaining high blood flow to low-perfusion tissues at the end of dialysis eliminates urea during the post-dialysis recovery period<sup>8</sup>.

Although hemodialysis alone plays a key role in urea elimination, the inclusion of intradialytic exercise presents itself as a comprehensive complement, as suggested by the available evidence. However, some studies were unable to confirm that exercise helps eliminate urea<sup>10</sup>.

Given that high urea concentrations are harmful in patients with CKD, and there is no consensus on the benefits of exercise, it is important to investigate the impact of exercise on the evolution of urea levels in these patients.

The objective of this study is to describe the evolution of urea levels over time when implementing a low-intensity aerobic physical exercise program in hemodialysis patients.

## MATERIALS AND METHODS

### Study design

We conducted a quasi-experimental longitudinal study at the Renal Replacement Therapy Unit of *Centro Médico Naval* (CEMENAV). It consisted of implementing an exercise program for CKD patients during hemodialysis sessions in May, June, and July of 2023.

### Population and sample

The study population included CKD patients on hemodialysis at CEMENAV's Renal Replacement Therapy Unit. A non-probability convenience sampling was used, including all individuals who met the inclusion criteria: **a)** patients of both sexes; **b)** older than 20 years; **c)** on hemodialysis therapy (at least, 3 months); **d)** on hemodialysis 3 times/week; **e)** having a functioning vascular access; and **f)** having signed the informed consent form.

Exclusion criteria included: **a)** patients with a recurrent history of complications while on hemodialysis (hypotension, tachycardia) over the past 2 months; **b)** diagnosis of myocardial infarction in the past 6 months; **c)** diagnosis of stroke; **d)** diagnosis of arrhythmia; **e)** lower limb amputation; **f)** musculoskeletal or respiratory conditions worsened by exercise; **g)** patients who voluntarily dropped out of the program; **h)** 3 absences from the physical exercise sessions; **i)** physical complications during hemodialysis sessions; and **j)** recurrent hospitalizations.

### Study variables

To characterize the sample, sociodemographic variables were collected: age (in completed years), sex (male or female), and occupation (active military, retired military, or beneficiary). The independent variable was aerobic physical exercise measured in three phases: warm-up, intense, and cool-down (in minutes), and the dependent variable was the evolution of urea levels (mg/dl).

### Data collection instrument

A data collection instrument was designed consisting of two sections: the first for sociodemographic variables and the second for aerobic physical exercise and the evolution of urea levels. For the latter, measurements were recorded at weeks 0, 6, 10, 14, and 16, and BUN pre and post-exercise samples were taken at the start and end of each hemodialysis session, respectively.

### Procedure

Upon admission to the hemodialysis service, the following routine data were collected: current body weight (to verify dry weight) and vital signs. These were not study variables. The hemodialysis machine was programmed, and the patient was connected. Ten minutes after starting treatment, a BUN pre-exercise blood sample was collected.

From the first hour of the hemodialysis session, patients began performing seated aerobic exercise using only their feet on a stationary pedal machine made of steel and rubber, measuring 37 cm × 49.5 cm × 23.5 cm and weighing 2.2 kg. The device has a digital display with five functions: time, counter, revolutions, calories, and scan.

The exercise program was divided into 3 phases: warm-up (10 minutes), intense (30 minutes), and cool-down (10 minutes). At the end of the hemodialysis session, a BUN post-exercise blood sample was taken.



The exercise program was conducted 3 times per week during hemodialysis sessions, with a duration of 50 minutes. Participants were organized into 2 groups on different days: Group 1 attended on Mondays, Wednesdays, and Fridays, while Group 2 attended on Tuesdays, Thursdays, and Saturdays.

The program lasted for 3 consecutive months (May, June, and July 2023). BUN blood tests were conducted at 5 points (weeks 0, 6, 10, 14, and 16). The exercise program started in week 1 and ended in week 15. During weeks 0 and 16, BUN pre and post tests were conducted without exercise.

The lead researcher and clinical advisor were responsible for training patients and supervising the exercise program.

### Statistical analysis

Data analysis was conducted using Excel. Quantitative variables were expressed as mean and standard deviation (SD), and qualitative variables as percentages and frequencies. BUN pre and post-exercise values were compared across different weeks using the Wilcoxon signed-rank test, with  $p \leq 0.05$  considered statistically significant.

### Ethical considerations

The entire study followed the ethical guidelines of CEMENAV's Research Ethics Committee and the Declaration of Helsinki, to protect participant integrity, rights, and privacy. All participants provided written informed consent. The study was approved by both the Research Committee and the Research Ethics Committee of CEMENAV.

## RESULTS

Although the initial study population included 50 adult patients from CEMENAV's hemodialysis unit, only 13 (26%) met the inclusion criteria, signed the informed consent, and started the exercise program. However, three patients withdrew in week four, leaving only 10 participants (20%).

Of the 10 participants, 50% ( $n=5$ ) were men and 50% ( $n=5$ ) women. Age distribution showed that 10% ( $n=1$ ) were 21–30 years old; 40% ( $n=4$ ), 41–50; 20% ( $n=2$ ), 51–60; and 30% ( $n=3$ ) were older than 60. Regarding occupation, 10% ( $n=1$ ) were active military; 20% ( $n=2$ ) retired military; and 70% ( $n=7$ ) beneficiaries.

The highest mean BUN pre-exercise value in men was recorded in week 0: 107.58 mg/dl (SD, 10.87); the mean post-exercise BUN was 37.62 mg/dl (SD, 9.10) that same week. In women, the highest mean BUN pre-exercise was also in week 0: 82.09 mg/dl (SD, 12.17), with a post-exercise value of 28.93 mg/dl (SD, 6.91).

The lowest BUN pre and post values in both men and women were recorded in week 14. BUN pre in men was 79.34 mg/dl (SD, 13.46) and in women 56.40 mg/dl (SD, 7.78). BUN post in men was 32.33 mg/dl (SD, 8.69) and in women, 16.71 mg/dl (SD, 5.47).

On week 16, when the exercise program had been suspended, BUN pre and post means increased vs week 14, but remained lower vs week 0. Complete BUN values are shown in **Table 1**.

BUN pre and post values were compared using the Wilcoxon signed-rank test. First, the test revealed a significant difference in BUN pre levels between week 0 (no exercise) and week 16 (also without exercise), with a  $p$ -value of 0.017.

Comparing BUN pre levels from week 0 to week 14 yielded a  $p$ -value of 0.005; comparing BUN post levels between those same weeks gave a  $p$ -value of 0.022. Finally, when comparing week 14 (last week with exercise) and week 16 (no exercise), the Wilcoxon test showed  $p$ -values of 0.007 (pre) and 0.005 (post), indicating a significant difference. Of note, by week 16 the exercise program had been discontinued (**Tables 2 and 3**).

**Table 1.** Mean and standard deviation of BUN with and without aerobic physical exercise (weeks 0–16), expressed in milligrams per deciliter (mg/dl).

Week		Men		Women	
		Mean	Standard deviation	Mean	Standard deviation
Week 0 (W/O Ex)*	BUN pre	107.58	10.87	82.09	12.17
	BUN post	37.62	9.10	28.93	6.91
Week 6 (W/ Ex)**	BUN pre	102.29	26.71	76.80	6.83
	BUN post	40.00	14.99	27.23	7.23
Week 10 (W/ Ex)	BUN pre	90.30	15.64	79.92	18.43
	BUN post	33.48	16.25	25.32	5.32
Week 14 (W/ Ex)	BUN pre	79.34	13.46	56.40	7.78
	BUN post	32.33	8.69	16.71	5.47
Week 16 (W/O Ex)	BUN pre	92.56	12.66	72.77	9.49
	BUN post	41.71	10.98	26.79	7.38

\*W/O Ex = without exercise. \*\*W/ Ex = with exercise.

**Table 2.** Differences in pre-dialysis BUN (comparison between weeks).

Weeks Compared	Average BUN (mg/dl)	p-value
Week 0 vs. Week 16	94.83 → 82.67	0.017
Week 0 vs. Week 14	94.83 → 67.87	0.005
Week 10 vs. Week 14	85.11 → 67.87	0.017
Week 14 vs. Week 16	67.87 → 82.67	0.007
Week 0 vs. Week 10	94.83 → 89.54	0.333

**Table 3.** Differences in post-dialysis BUN (comparison between weeks).

Weeks Compared	Average BUN (mg/dl)	p-value
Week 0 vs. Week 6	33.27 → 33.61	0.799
Week 0 vs. Week 14	33.27 → 24.52	0.022
Week 10 vs. Week 14	29.40 → 24.52	0.047
Week 14 vs. Week 16	24.52 → 34.25	0.005

## DISCUSSION

This study implemented an intradialytic exercise program in CKD patients on hemodialysis for 3 months. The results suggest a significant reduction in blood urea levels during the exercise program.

These findings are consistent with previous studies such as those by Alonso et al.<sup>9</sup> and Paluchamy et al.<sup>10</sup>, who examined the effects of exercise during dialysis sessions. Alonso et al.<sup>11</sup> conducted a before-and-after study with 29 patients using a combination of aerobic and resistance training. Like in this study, a pedal machine was used for aerobic activity. They also employed resistance bands for quadriceps, foot dorsiflexors, and glutes. Sessions lasted 30–60 minutes.

The results of Alonso et al.<sup>9</sup> indicate that the incorporation of exercise during dialysis led to improvements in dialysis efficiency, with an increase in solute clearance, including urea. This result aligns with the evolution of urea levels observed in the present study, as pre- and post-dialysis BUN analyses showed that urea values decreased in patients over time when the exercise program was implemented. Notably, urea levels increased after the program was discontinued (82.67 mg/dl on week 16), although they did not return to the levels recorded before the program began (94.83 mg/dl on week 0).

Similar results were obtained in the experimental study by Paluchamy et al.<sup>11</sup>. That study reported improvements in parameters such as Kt/V, blood urea, serum creatinine, serum potassium, phosphorus, and quality of life in 20 patients who participated in an intradialytic exercise program within the first 2 hours on dialysis. The finding of reduced blood urea specifically is consistent with that of the present study. It was inferred that the exercise program is complementary, a conclusion also drawn in this study.

Previous studies reinforce the idea that aerobic physical exercise helps eliminate urea during hemodialysis—a conclusion also reached in the present research, as the progression of urea levels suggests a reduction in blood urea, at least during the period in which the exercise program was implemented.

Compared to previous studies, it is evident that few have examined a physical activity profile similar to that used in this

study. The aspects evaluated in those studies that resemble the present one include the duration of the program (12 weeks), the timing of exercise during the dialysis session (after the first hour of treatment), and the duration of low-intensity aerobic exercise using stationary pedals (50 minutes).

The limitations of the present study were that the results cannot be extrapolated to other populations, since the study population is Mexican; it was not possible to form a control group to compare the impact of the exercise program with the results obtained here; and finally, the sample size is small, which also limits generalizability.

Based on the results obtained, it is possible to conclude that performing an aerobic physical exercise program during hemodialysis sessions is associated with a decrease in pre- and post-dialysis urea levels over time. Based on the data obtained, it can be stated that implementing the aerobic exercise program may increase urea clearance during the period it was carried out in combination with hemodialysis treatment. However, it is not possible to affirm that a sustained reduction in urea would continue if the program were to be maintained.

As a recommendation, the possibility of implementing the program during hemodialysis sessions in hospital centers is proposed to maintain control of blood urea levels and prevent future complications in patients with CKD. However, follow-up studies with larger populations are necessary to assess the feasibility, acceptability, and effectiveness of the program.

## Conflicts of interest

The authors declare no conflicts of interest related to the research, authorship, and/or publication of this manuscript.

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# Depression, anxiety and stress in people on renal replacement therapy from the City of Chihuahua

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## ABSTRACT

**Introduction:** Chronic kidney disease is a progressive condition that deteriorates quality of life. Patients not only face physical challenges, but also emotional and social ones, which can generate high levels of depression, anxiety, and stress.

**Objective:** To analyze the presence and intensity of depression, anxiety, and stress in people on renal replacement therapy from the city of Chihuahua.

**Material and Method:** We conducted a descriptive and cross-sectional study in a medical unit specialized in kidney disease in Chihuahua (Mexico). All patients on renal replacement therapy participated (n = 60). A sociodemographic form was applied for data collection, allowing the identification and characterization of participants. The DASS-21 Scale was used to assess the presence and intensity of affective states associated with depression, anxiety, and stress.

**Results:** Significant differences were observed according to the therapy. In peritoneal dialysis, 40% exhibited severe depression; 50%, moderate anxiety; and 45%, severe stress, while in hemodialysis the "Normal" category predominated in depression (55%) and anxiety (50%), with only 20% reporting severe stress. Additionally, a total of 83.3% reported constant thoughts about their illness and 31.7% hopelessness, evidencing a greater psychological impact in peritoneal dialysis.

**Conclusions:** Psychological impact in patients on renal replacement therapy, particularly on peritoneal dialysis, is

highlighted. It is recommended to implement psychosocial interventions and develop comprehensive health policies that address their physical and emotional well-being holistically.

**Keywords:** renal replacement therapy; depression; anxiety and stress.

## RESUMEN

**Depresión, ansiedad y estrés en personas con terapia de sustitución renal de la ciudad de Chihuahua**

**Introducción:** La enfermedad renal crónica es una afección progresiva que deteriora la calidad de vida. Los pacientes no solo enfrentan desafíos físicos, sino también emocionales y sociales, lo que puede generar elevados niveles de depresión, ansiedad y estrés.

**Objetivo:** Analizar la presencia e intensidad de depresión, ansiedad y estrés en personas en terapia de sustitución renal de la ciudad de Chihuahua.

**Material y Método:** Se realizó un estudio descriptivo y transversal en una unidad médica especializada en enfermedad renal de Chihuahua, participaron la totalidad de pacientes en terapia de sustitución renal (n=60). Para la recolección de datos se aplicó una cédula sociodemográfica, permitiendo identificar y caracterizar a los participantes. Para evaluar la presencia e intensidad de los estados afectivos asociados a la depresión, la ansiedad y el estrés se utilizó la Escala DASS-21.

**Resultados:** Se observaron diferencias significativas según la terapia. En diálisis peritoneal, el 40% presentó depresión severa, el 50% ansiedad moderada y el 45% estrés severo, mientras que en hemodiálisis predominó la categoría "Normal" en depresión (55%) y ansiedad (50%), con solo el 20% con estrés severo. Además, el 83,3% reportó pensamientos constantes sobre su enfermedad y el 31,7% falta de esperanza, evidenciando un mayor impacto psicológico en diálisis peritoneal.

**Conclusiones:** Se destaca el impacto psicológico en pacientes con terapia de sustitución renal, particularmente en diálisis peritoneal. Se recomienda implementar intervenciones psicosociales y desarrollar políticas de salud integrales que aborden integralmente su bienestar tanto físico como emocional.

**Palabras clave:** terapia de sustitución renal; depresión; ansiedad y estrés.

## INTRODUCTION

Chronic kidney disease (CKD) has emerged as a global health crisis, deeply affecting patients' quality of life<sup>1</sup>. Beyond clinical complications, CKD imposes physical, emotional, and social challenges that reshape the daily lives of those affected<sup>2-3</sup>. As disease progresses, renal replacement therapies such as hemodialysis, peritoneal dialysis, or kidney transplantation become essential for prolonging life<sup>4</sup>. However, these interventions affect the patient's autonomy, family environment, and social integration<sup>5,6</sup>. The demands of treatment, along with emotional and financial burdens, create additional challenges that influence therapeutic adherence and the perception of well-being<sup>7,8</sup>. This highlights the importance of approaching CKD from a multidimensional perspective that considers not only medical treatment but also psychosocial support strategies that promote the comprehensive well-being of affected individuals<sup>9,10</sup>.

Globally, the prevalence of psychological disorders in individuals undergoing renal replacement therapy is alarmingly high<sup>6</sup>. It is estimated that between 20% and 30% of dialysis patients experience significant symptoms of depression<sup>4</sup>. The prevalence of anxiety is also elevated, with recent studies indicating it affects more than 30% of hemodialysis patients, while stress is also common due to treatment-related stressors such as dependence on machines, reduced autonomy, and physical side effects<sup>4</sup>.

Nationwide, Mexico is facing a growing prevalence of CKD, with approximately 12 million people diagnosed, around 200,000 of whom require renal replacement therapy<sup>11</sup>. Recent studies show that up to 30% of dialysis patients in Mexico experience moderate to severe symptoms of depression, and between 20% and 40% suffer from significant anxiety and stress<sup>7</sup>. These statistics underscore the urgent

need to implement psychosocial intervention strategies to improve this population's quality of life and complement medical treatments.

At state level, Chihuahua has one of the highest CKD rates in the country, affecting primarily the most vulnerable sectors of the population. In the city of Chihuahua, it is estimated that between 25% and 35% of hemodialysis patients report symptoms of depression, while approximately 30% experience significant levels of anxiety, indicating an urgent need for mental health care. However, there is a lack of detailed local studies addressing the specific psychological effects of renal replacement therapy in this region, limiting the healthcare system's ability to identify and effectively address these issues<sup>7</sup>.

This study aims to analyze the presence and intensity of depression, anxiety, and stress in individuals undergoing renal replacement therapy in the city of Chihuahua. By evaluating these factors, the goal is to generate local data to inform specific mental health policies and contribute to the development of appropriate intervention strategies for this population.

## MATERIAL AND METHOD

We conducted a cross-sectional descriptive observational study in individuals undergoing renal replacement therapy (peritoneal dialysis and hemodialysis) at a specialized renal disease unit in the city of Chihuahua. The sample included all individuals attending renal replacement therapy (n=60). Inclusion criteria required individuals to be undergoing dialysis therapy before completing the instruments and to be adults. Patients diagnosed with mental disorders, neurological conditions, or cognitive disabilities that impaired comprehension of the instruments were excluded.

Visits to the specialized medical unit were made on the dates and times assigned by the institution to coordinate patient access. Patients were given a detailed explanation of the study and were then asked to complete the instruments, beginning with an identification form that collected sociodemographic data to help understand and characterize participants.

The Depression Anxiety and Stress Scale (DASS-21), developed by Lovibond & Lovibond (1995)<sup>12</sup>, was administered. This self-report instrument evaluates the presence and intensity of affective states of depression, anxiety, and stress. Each item is rated according to the presence and intensity of symptoms over the past week on a 4-point Likert scale (0-3). Each scale includes seven items, with total scores ranging from 0 to 21. The depression scale assesses dysphoria, lack of meaning, self-depreciation, disinterest, and anhedonia. The anxiety scale includes subjective and somatic symptoms of fear, autonomic arousal, situational anxiety, and anxious affect. The stress scale evaluates non-specific persistent arousal, difficulty relaxing, irritability, and impatience.



Instruments were completed based on the time participants could dedicate; in some cases, administration was paused and resumed as needed to complete the instruments fully while allowing necessary rest.

### Statistical analysis

Data analysis was conducted using SPSS® version 29.0. Descriptive statistics (frequencies, proportions, point estimates with 95% confidence intervals, and measures of central tendency) were used. Inferential statistics were also employed, including Chi-square tests ( $X^2$ ) to examine relationships between levels of depression, anxiety, and stress by type of renal replacement therapy and sociodemographic variables. A Linear Regression Model was developed to evaluate the effect of months on therapy and the depression, anxiety, and stress indices on the type of renal replacement therapy.

### Ethical considerations

This study adhered to the General Health Law for Health Research; ethical considerations ensured the dignity and well-being of individuals involved in the study<sup>13</sup>. The study was approved by the Ethics and Research Committees of the Faculty of Nursing and Nutrition (FEN) at *Universidad Autónoma de Chihuahua* (UACH), registration No. SIP-CEINV/31/2023, following the guidelines of Mexico's General Health Law for Health Research. Informed consent was obtained and signed by all participants.

## RESULTS

All individuals ( $n=60$ ) undergoing renal replacement therapy (peritoneal dialysis and hemodialysis) at an outpatient medical unit specializing in kidney disease in Chihuahua participated.

Regarding sociodemographic characteristics, 65% ( $n=39$ ) were men, and 35% ( $n=21$ ) were women. A total of 30% ( $n=18$ ) had secondary education, 28.3% ( $n=17$ ) had high school education, and only 6.7% ( $n=4$ ), professional education. The mean age was 56.6 years (SD, 13.407), with a range from 18 to 86 years. The average time in months on renal replacement therapy was 17.25 (SD, 17.838), ranging from 1 to 96 months.

**Table 1** shows the type of renal replacement therapy by gender. Among men, 25% ( $n=15$ ) were on dialysis and 40% ( $n=24$ ) on hemodialysis. Among women, 8.3% ( $n=5$ ) were on dialysis and 26.7% ( $n=16$ ) on hemodialysis. Regarding

**Table 1.** Sex-based Renal Replacement Therapy.

Variable $n=60$	Dialysis		Hemodialysis	
	f	%	f	%
Male	15	25.0	24	40.0
Female	5	8.3	16	26.7

f= frequency, %= percentage, n= total number of observations.

personal feelings about their kidney disease, 51.7% ( $n=31$ ) felt satisfied with their current life; however, 83.3% ( $n=50$ ) reported having persistent thoughts about the disease, and 31.7% ( $n=19$ ) expressed hopelessness about the future.

To meet the study's objective of analyzing depression, anxiety, and stress in individuals undergoing renal replacement therapy in Chihuahua, the following was found:

**Table 2** shows depression, anxiety, and stress levels by gender. In men, the most frequent depression categories were "Normal" and "Extremely Severe," both at 30.8% ( $n=12$ ). In women, the "Normal" category was most prevalent at 52.4% ( $n=11$ ), followed by "Extremely Severe" at 28.6% ( $n=6$ ). No statistically significant difference was found in depression distribution by gender (Chi square test=5.136;  $p=0.274$ ). For anxiety, the most common category among men was "Moderate" at 41% ( $n=16$ ), while women were mostly in the "Normal" category at 47.6% ( $n=10$ ), followed by "Moderate" at 19.0% ( $n=4$ ), again with no significant gender difference (Chi square test= 3.862;  $p= 0.425$ ).

For stress, the most common categories in men were "Extremely Severe" at 38.5% ( $n=15$ ) and "Severe" at 28.2% ( $n=11$ ). Among women, "Normal" was most frequent at 52.4% ( $n=11$ ), with "Extremely Severe" being lower at 9.5% ( $n=2$ ), indicating a statistically significant gender difference in stress levels (Chi square test= 12.153;  $p= 0.016$ ).

When cross-tabulating the variables of depression, anxiety, and stress by type of renal replacement therapy (**Table 3**), it was found that, regarding depression in patients undergoing peritoneal dialysis, the categories "Severe" and "Extremely Severe" had the highest frequencies, with 40.0% ( $n=8$ ) each. In contrast, among hemodialysis patients, the "Normal" category was the most prevalent at 55.0% ( $n=22$ ), followed by "Extremely Severe" at 25.0% ( $n=10$ ), indicating a statistically significant difference (chi square test=19.127;  $p=0.001$ ) in the distribution of depression levels between the two groups<sup>2</sup>. This suggests that patients on peritoneal dialysis have a higher prevalence of severe and extremely severe depression compared to those on hemodialysis. Regarding anxiety in peritoneal dialysis patients, the "Moderate" category was the most frequent at 50.0% ( $n=10$ ), followed by "Severe" at 30.0% ( $n=6$ ). In hemodialysis patients, the "Normal" category predominated at 50.0% ( $n=20$ ), followed by "Moderate" at 25.0% ( $n=10$ ), also revealing a statistically significant difference in the distribution of anxiety levels between the two groups (chi-square test= 14.839;  $p=0.0005$ ). Patients on peritoneal dialysis appear to exhibit higher levels of anxiety in the more severe categories compared to those on hemodialysis.

Similarly, for the variable of stress, there was a statistically significant difference in the distribution of stress levels between the two groups (chi-square test= 14.597;  $p= 0.006$ ). This suggests that patients undergoing peritoneal dialysis experience higher levels of severe stress compared to those undergoing hemodialysis.

**Table 2.** Levels of Depression, Anxiety, and Stress by Sex.

Category	Level	Male (f)	Male (%)	Female (f)	Female (%)	Chi-square test
Depression	Normal	12	30.8%	11	52.4%	5.136 P = 0.274
	Mild	1	2.6%	–	4.7%	
	Moderate	4	10.2%	2	9.5%	
	Severe	10	25.6%	–	4.7%	
	Extremely Severe	12	30.8%	6	28.6%	
Anxiety	Normal	11	28.2%	10	47.6%	3.862 P = 0.425
	Mild	2	5.1%	–	9.5%	
	Moderate	16	41.0%	–	19.0%	
	Severe	6	15.4%	–	14.3%	
	Extremely Severe	4	10.3%	2	9.5%	
Stress	Normal	10	25.6%	11	52.4%	12.153 P = 0.016
	Mild	–	0.0%	–	9.5%	
	Moderate	3	7.7%	–	0.0%	
	Severe	11	28.2%	6	28.6%	
	Extremely Severe	15	38.5%	2	9.5%	

f= frequency, %= percentage; p= significance, n =60.

**Table 3.** Levels of Depression, Anxiety, and Stress by Type of Renal Replacement Therapy.

Variable	Level	Male		Female		Chi-square
		f	%	f	%	
Depression	Normal	1	5.0%	22	55.0%	19.127 P = 0.001
	Mild	0	0.0%	2	5.0%	
	Moderate	3	15.0%	3	7.5%	
	Severe	8	40.0%	3	7.5%	
	Extremely Severe	8	40.0%	10	25.0%	
Anxiety	Normal	10	0.0%	20	50.0%	14.839 P = 0.005
	Mild	0	0.0%	3	7.5%	
	Moderate	5	25.0%	10	25.0%	
	Severe	3	15.0%	3	7.5%	
	Extremely Severe	2	10.0%	4	10.0%	
Stress	Normal	1	5.0%	11	27.5%	14.597 P = 0.006
	Mild	0	0.0%	2	5.0%	
	Moderate	1	5.0%	1	2.5%	
	Severe	9	45.0%	3	7.5%	
	Extremely Severe	9	45.0%	8	20.0%	

f= frequency, %= percentage, p= significance level, n= 60.

Furthermore, **Table 4** presents a Multiple Linear Regression model examining the effect of the study variables –depression, anxiety, and stress– on the type of renal replacement therapy. The model was found to be statistically significant [ $F(2,57)=8.157$ ;  $p=0.001$ ], explaining 22.3% of the variability in the type of renal replacement therapy ( $R^2=0.223$ ). Moreover,

the depression, anxiety, and stress index showed a significant and negative effect ( $\beta=-0.008$ ;  $t=-3.947$ ;  $p=0.001$ ), with a 95% confidence interval ( $-0.013$ ,  $-0.004$ ), indicating that a higher index is associated with a lower probability of certain types of renal replacement therapy.

## DISCUSSION

The results of the present study reveal significant levels of depression, anxiety, and stress among patients undergoing renal replacement therapy in the city of Chihuahua, with notable differences between treatment modalities (peritoneal dialysis and hemodialysis). These findings are consistent with previous studies that highlight the high prevalence

of psychological disorders in patients with advanced chronic kidney disease (CKD), due to the physical, emotional, and social demands of treatment<sup>4,6</sup>.

Regarding depression, patients on peritoneal dialysis showed higher levels in the “Severe” and “Extremely Severe” categories compared to hemodialysis patients, in whom the “Normal” category predominated. This difference may be attributed to the psychological burden associated with the home management of peritoneal dialysis, which requires greater autonomy and responsibility on the part of the patient. Previous studies have indicated that reduced self-efficacy and the perception of isolation in home-based treatment increase the likelihood of developing severe depressive symptoms<sup>2,3</sup>.

As for anxiety, patients on peritoneal dialysis also presented higher levels in the “Moderate” and “Severe” categories. This finding is consistent with research indicating that patients managing treatments at home experience greater uncertainty regarding the effectiveness of the procedure and potential complications, which increases anxiety levels<sup>4,6</sup>. On the other hand, the present study's

results suggest that hemodialysis patients report lower levels of anxiety, possibly due to the continuous clinical support provided in this setting. According to previous studies, when replacement therapy is carried out in a supervised clinical environment, it offers a sense of safety and support that may contribute to lower anxiety levels compared to peritoneal dialysis<sup>10,14</sup>.

The variable stress also showed significant differences between the two groups, being more severe in patients on

**Tabla 4.** Multiple Linear Regression for the Effect of Depression, Anxiety, and Stress on Type of Renal Replacement Therapy.

Variable	B	SE	t	p-value	95% CI (LL)	95% CI (UL)
Constant	1.912	0.107	17.935	0.001	1.699	2.126
Time in Months on Renal Replacement Therapy	0.005	0.003	1.626	0.109	-0.001	0.012
Depression, Anxiety, and Stress Index	-0.008	0.002	-3.947	0.001	-0.013	-0.004

	SS	df	MS	F
Regression	2.967	2	1.483	8.157
Residual	10.366	57	0.182	

Model 1:  $R^2 = 0.223$ , SEE = 0.426,  $p = 0.001$ 

B= beta coefficient, SE= standard error,  $R^2$ = coefficient of determination, t= Student's t, SEE= standard error of estimate, SS= sum of squares, df= degrees of freedom, MS= mean square, CI= confidence interval (LL= lower limit, UL= upper limit), n= 60.

peritoneal dialysis. This finding may be due to the physical and emotional demands involved in self-managing treatment, as reported in studies analyzing the relationship between stress and renal replacement therapy modalities<sup>8</sup>. Additionally, factors such as prolonged treatment duration, economic burden, and lack of psychosocial support contribute to heightened stress in this population<sup>4,5</sup>.

Another relevant finding was the high proportion of patients who reported constant thoughts about their illness and a significant percentage who expressed hopelessness about the future<sup>8</sup>. This is associated with the intensity of suffering these patients endure—stemming from both the illness itself and the surrounding environment<sup>2,4</sup>. This highlights the need for psychosocial interventions aimed at improving patients' well-being and resilience. The literature supports that psychological support programs and cognitive-behavioral therapies can be effective in reducing the impact of these disorders on patients' quality of life<sup>4,9</sup>.

In general terms, the results of this study are consistent with international literature, which reports high prevalence rates of depression, anxiety, and stress in patients with advanced CKD. However, a higher prevalence of these conditions was observed in patients in Chihuahua, which could be related to cultural and socioeconomic factors, as well as specific characteristics of the regional healthcare system<sup>8</sup>.

This study has several limitations that should be considered when interpreting the results. First, the small sample size (n=60) limits the generalizability of the findings, even though the entire population from the selected unit was included. It is recommended that the study be extended to other institutions. Additionally, the cross-sectional design prevents causal inferences; certain confounding factors such as social support and comorbidities were not controlled, and the lack of longitudinal follow-up prevents the assessment of changes over time. Comparability between groups may be affected by the absence of randomization, and the results may be influenced by contextual factors specific to the medical unit where the study was conducted.

In conclusion, this study reveals that patients undergoing renal replacement therapy in the city of Chihuahua exhibit significant levels of depression, anxiety, and stress, with a higher prevalence of severe symptoms among those receiving peritoneal dialysis compared to hemodialysis patients. Although no statistically significant differences in depression and anxiety were observed between genders, men showed higher levels of severe stress. Additionally, most participants reported persistent thoughts about their illness, and a considerable proportion expressed a lack of hope for the future, highlighting a significant psychological impact. These findings underscore the need for psychosocial interventions aimed at mitigating these effects and improving the quality of life in this population, as well as the development of public policies that comprehensively address the physical and emotional aspects of patients with chronic kidney disease.

### Conflicts of interest

The authors declare no conflicts of interest related to the research, authorship, and/or publication of this manuscript.

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# “JANDRY LORENZO” GRANT 2025



The SPANISH SOCIETY OF NEPHROLOGY NURSING (SEDEN) sponsors this grant to promote research aimed at expanding knowledge in the field of nephrology nursing. The deadline to apply is June 30<sup>th</sup>, 2025, under the following:

- 1.- Projects may be submitted by nurses who are full members of **SEDEN** and up to date with their membership fees. Other professionals may be included as co-authors to promote interdisciplinary collaboration.
- 2.- Submit an anonymous, detailed project (no length limit) including: Introduction (background and current state of the topic), **Objectives** (and hypothesis if applicable), **Methodology** (setting, design, population and sample, measurement tools, data collection, and statistical analysis), **References**, **Project timeline**, and **Estimated budget**. Send via email to: [seden@seden.org](mailto:seden@seden.org)
- 3.- The **SEDEN** Board will appoint an Evaluation Committee to act as jury. The decision will be communicated by September 13<sup>th</sup>, 2025.  
Award Details:  
The grant includes a diploma presented at the opening session of the 50th SEDEN Congress (2025) and a monetary award of €1,800\*.  
50% will be paid upon award notification. The remaining 50% will be paid upon project completion.
- 4.- Awardees agree to submit the final research project to **SEDEN** by September 12<sup>th</sup>, 2026. Extensions of up to 6 months may be requested. If not submitted, the remaining 50% will not be paid. The final report must include: introduction, methods, results, discussion, and bibliography. It must be presented at the LI **SEDEN** Congress, with one of the authors as presenter. Submissions by non-authors will not be accepted.
- 5.- The final project must adhere to **Enfermería Nefrológica's** publication guidelines and will undergo peer review. If rejected, it will be published on the **SEDEN** website.
- 6.- The project may not be published or presented elsewhere until conditions 5 and 6 are fulfilled. The award must be acknowledged as Jandry Lorenzo Grant 2025 in all uses.
- 7.- Applying implies acceptance of these rules and the jury's decision, which is final.
- 8.- The grant may be declared void.

*\*The monetary award is subject to tax withholding.*



# Knowledge of nephrological nursing staff on chronic kidney disease-related pruritus

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## ABSTRACT

**Introduction:** Chronic kidney disease-pruritus is the sensation of itching related to the disease without another disease justifying it. Although its prevalence may have decreased, it still persists and is underdiagnosed.

**Objective:** To analyze the knowledge and usual practice of the nursing staff in our unit on the management of pruritus.

**Material and Method:** We conducted a descriptive, single-center study in March 2023 using a self-designed survey on the degree of knowledge and usual practice of the nursing staff in our nephrology unit regarding pruritus.

**Results:** 24 surveys (96% participation): 62.5% women with an age of  $43.8 \pm 11.8$  and  $14.2 \pm 11.1$  years of working experience. A total of 41.6% (n=10) adequately estimated the prevalence of pruritus in our center. A total of 78% (n=21) diagnosed only if the patient reported it, while 50% (n=12) did not use specific assessment scales.

The simple visual analog scale (VAS) 21% (n=5) and the verbal numerical scale of worst itch (WI-NRS) 21% (n=5) were the most widely used. A total of 92% (n=22) and 71% (n=17) had knowledge of the main hygienic-dietary advice and possible causes of pruritus. All respondents considered that chronic kidney disease-related pruritus damaged the patient's quality of life and considered it useful to receive educational training.

**Conclusiones:** The nursing staff have adequate knowledge about chronic kidney disease-related pruritus. A proactive attitude towards its diagnosis and greater use of specific questionnaires are aspects to improve in our routine clinical practice.

**Keywords:** pruritus; chronic kidney disease; nephrological nursing.

## RESUMEN

**Conocimiento del personal de enfermería nefrológica sobre el prurito asociado a enfermedad renal crónica**

**Introducción:** El prurito asociado a la enfermedad renal crónica es la sensación de picor relacionada con la enfermedad sin otra patología que lo justifique. Su prevalencia ha podido disminuir, aunque todavía persiste y está infradiagnosticado.

**Objetivo:** Analizar el conocimiento y práctica habitual de la enfermería de nuestra unidad sobre el manejo del prurito.

**Material y Método:** Estudio unicéntrico descriptivo, realizado en marzo de 2023 mediante encuesta auto diseñada sobre el grado de conocimiento y la práctica habitual del personal de enfermería de nuestra unidad de nefrología, sobre el prurito.

**Resultados:** 24 encuestas (96% de participación). 62,5% mujeres con edad de  $43,8 \pm 11,8$  y  $14,2 \pm 11,1$  años de experiencia laboral.

Un 41,6% (n=10) estimó adecuadamente la prevalencia del prurito en nuestro centro. Un 78% (n=21) diagnosticaba solo si lo manifestaba el paciente y un 50% (n=12) no utilizaba escalas de valoración específicas.

La escala visual analógica simple (EVA) 21% (n=5) y la escala numérica verbal del peor picor (WI-NRS) 21% (n=5), fueron las más utilizadas. Un 92% (n=22) y un 71% (n=17) tenían conocimiento de los principales consejos higiénico-dietéticos y posibles causas del prurito. Todos los encuestados consideraban que el prurito asociado a la enfermedad renal afectaba a la calidad de vida del paciente y consideraron de utilidad recibir formación educativa.

**Conclusiones:** Enfermería tiene conocimientos adecuados sobre el prurito asociado a la enfermedad renal crónica. Una actitud proactiva hacia su diagnóstico y una mayor utilización de cuestionarios específicos son aspectos que mejorar en nuestra práctica habitual.

**Palabras clave:** prurito; enfermedad renal crónica; enfermería nefrológica.

## INTRODUCTION

Chronic kidney disease-associated pruritus (CKD-aP) is the sensation of itching directly related to kidney disease, without any another condition justifying it<sup>1</sup>. Although the prevalence of CKD-aP has decreased in recent years, due in part to improvements in dialysis techniques and treatment of kidney patients, it still persists and remains underdiagnosed<sup>1,3</sup>. CKD-aP is associated with a high disease burden and a significant negative impact on patients' quality of life<sup>4,5</sup>. Therefore, it is important to appropriately address the diagnosis and treatment of this symptom.

Nursing staff in hemodialysis (HD) play a fundamental role in the care and diagnosis of CKD-aP by helping to identify this symptom and facilitate its appropriate therapeutic management<sup>2,4,6</sup>. Thus, the knowledge of nursing staff regarding CKD-aP and its appropriate management in daily practice are key factors in the proper handling of this symptom.

The objective of our study was to analyze the level of knowledge and routine practices of the nursing staff regarding CKD-aP in our dialysis unit, with the aim of proposing intervention strategies to improve the care of patients with CKD-aP.

## MATERIAL AND METHOD

We conducted a single-center descriptive study during March 2023 at the Consorci Sanitari Terrassa.

A self-designed survey was developed and directed to the nursing staff of our nephrology unit (hemodialysis, peritoneal dialysis, and Advanced Chronic Kidney Disease outpatient clinic) using Microsoft Forms, a corporate application included in the Office 365 package provided by the Center for Telecommunications and Information Technology.

The anonymous and voluntary survey consisted of 14 multiple-choice Likert-type questions, including sociodemographic and professional data as well as various aspects related to the knowledge and routine practical management of CKD-aP in our HD unit: data on estimated prevalence in our unit, the use of specific assessment scales, knowledge of hygiene-dietary recommendations and potential causes of CKD-aP, main prescribed treatments, and training needs (**Annex 1**).

Once data were collected, a descriptive statistical analysis was conducted using SPSS software, version 27 (SPSS Inc., Chicago, IL, United States). Quantitative variables were expressed as mean and standard deviation. Qualitative variables were expressed as percentages or frequency distributions.

The entire study was conducted in accordance with Good Clinical Practice guidelines and the Declaration of Helsinki, following approval and institutional regulations.

## RESULTS

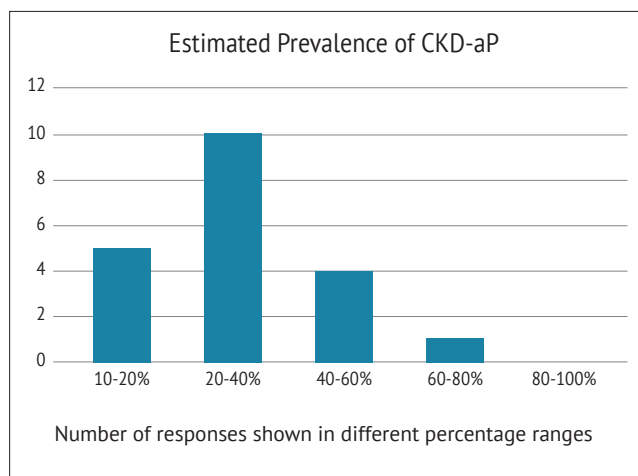
A total of 24 out of the 25 nurses in the nephrology unit completed the survey (a 96% response rate).

A total of 62.5% (n=15) of respondents were women, with a mean age of 43.8±11.8 years. The mean professional experience was 14.2±11.1 years. A total of 58.3% (n=14) of the nursing staff worked exclusively in the hospital setting. Another 37.5% (n=9) worked both in the hospital and dialysis centers. The primary area of work was HD, with 83.3% (n=20) of nurses; 12.5% (n=3) worked in the peritoneal dialysis outpatient clinic, and 4.1% (n=1) in the kidney transplant unit.

Regarding knowledge of CKD-aP prevalence in our HD unit (previously reported at 29.7%), only 41.6% (n=10) of respondents were aware of this figure. A total of 37.5% (n=9) underestimated and 20.8% (n=5) overestimated the prevalence of CKD-aP in our unit (**Figure 1**).

When asked about the diagnosis of CKD-aP, respondents could choose more than one answer, resulting in 27 total responses. In 78% (n=21) of cases, pruritus was only diagnosed if the patient self-reported it; 15% (n=4) diagnosed it if directly asked; 4% (n=1) used a non-specific scale or questionnaire; and 4% (n=1) used other methods, such as information from family members.

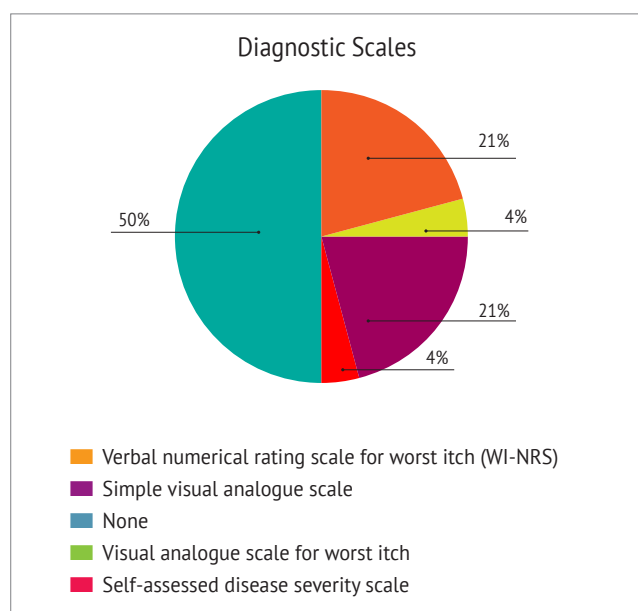
A total of 50% (n=12) of respondents did not use specific, validated scales to assess pruritus in patients with chronic kidney disease (CKD). Among those who did, the most used



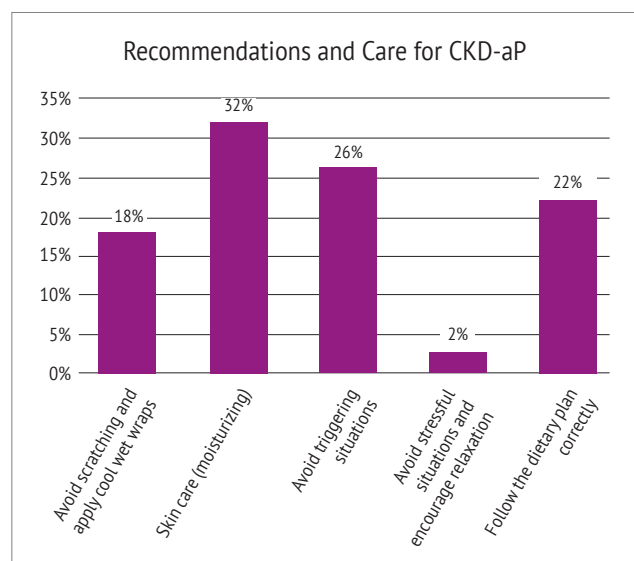
**Figure 1.** Estimated prevalence of chronic kidney disease-associated pruritus (CKD-aP) in our unit, according to nursing staff.

were the simple visual analog scale (VAS) 21% (n=5) and the verbal numerical rating scale for worst itch (WI-NRS) 21% (n=5). Other scales like the Self-Assessed Disease Severity Scale (SADS) 4% (n=1) and the VAS for worst itch 4% (n=1) were least used (**Figure 2**).

Regarding knowledge of key hygiene-dietary advice and potential etiopathogenic mechanisms of CKD-aP, 92% (n=22) and 71% (n=17) respectively were considered adequately informed. Furthermore, all respondents believed CKD-aP negatively impacted the patients' quality of life.



**Figure 2.** Main scales used by nursing staff for diagnosing chronic kidney disease-associated pruritus (CKD-aP).



**Figure 3.** Main hygienic-dietary recommendations and advice provided to patients with chronic kidney disease-associated pruritus (CKD-aP) in our unit.

In terms of the main recommendations made by nursing staff, 68 responses were obtained. In 32% (n=22), skin hydration was advised; in 26% (n=18), avoiding triggering situations; and in 22% (n=15), following the prescribed diet correctly. Less commonly, 18% (n=12) recommended avoiding scratching and applying cool wet wraps, while 2% (n=1) advised avoiding stress and promoting relaxation (**Figure 3**).

Regarding knowledge of routinely prescribed medical treatments, of the 34 responses obtained, antihistamines (47%, n=16) and moisturizing creams (32%, n=11) were most frequently cited. Gabapentin was mentioned by 12% (n=4) and corticosteroids by 9% (n=3). Notably, 62.5% (n=15) of nurses were unaware of any specific treatment currently available for CKD-aP.

Finally, all respondents considered it useful to receive training on CKD-aP. A total of 29 preferences were recorded: 48% (n=14) preferred educational workshops, 24% (n=7) lectures, 21% (n=6) online courses, and 7% (n=2) webinars.

## DISCUSIÓN

The results of our study provide valuable insight into various aspects of nursing knowledge and clinical management of CKD-aP in daily practice. Our findings also help identify areas for improvement in training and practice among nurses in our unit to enhance the diagnosis and treatment of this distressing symptom in the HD setting.

We observed a high participation rate, making the results representative of our HD nursing staff. The ease of answering the survey, familiarity with digital tools, and heightened

sensitivity of our unit toward appropriate management of CKD-aP likely contributed to this response rate. This level of participation also reflects a strong commitment from our nursing staff to improve patient care.

Despite high engagement, many respondents were unable to correctly identify the estimated prevalence of CKD-aP in our unit. A significant portion underestimated the reported figure, again highlighting the underdiagnosis of CKD-aP<sup>7,9</sup>.

Moreover, only a small proportion of nurses showed a proactive attitude toward diagnosing CKD-aP, with most cases being reported spontaneously by patients.

Nurses play a critical role in addressing pruritus, as they are the health care professionals with the most frequent and close contact with kidney patients. They are ideally positioned to proactively investigate and initiate appropriate treatment for this symptom<sup>4,6,8,10</sup>.

Only half of respondents used validated pruritus assessment scales. While the simple VAS and WI-NRS were most frequently used, more specific tools tailored to the patient population should be considered to avoid underestimating the severity of pruritus. It is recommended to routinely evaluate both itch intensity and its impact on quality of life using two self-assessment scales<sup>5,7,9,11</sup>. Thus, implementing the WI-NRS and SADS scales could improve diagnosis and treatment of CKD-aP.

Of note, the strong knowledge among nurses on hygiene-dietary recommendations, including skin hydration, avoiding triggers, and following dietary guidance. These are essential for proper CKD-aP management and improve quality of life significantly<sup>4,5,8,12-14</sup>. However, their effectiveness may vary and should be tailored individually.

Most nurses indicated familiarity with CKD-aP pathophysiology, likely based on its traditional association with mineral bone disorder<sup>1,5,8,14</sup>. However, since the question was dichotomous (yes/no), responses may be overestimated, and newer mechanisms like dysregulation of kappa and mu opioid receptors remain less known among staff.

In terms of pharmacologic treatment, antihistamines and gabapentinoids were most frequently mentioned. However, a significant number of respondents were unaware of newer therapies available in the short term<sup>13,14</sup>. This highlights the need for further training on up-to-date treatment options for CKD-aP.

This need for training was also expressed by our staff, with a preference for workshops and in-person sessions. We plan to implement these training formats in our HD unit.

One strength of our study is the ease and speed of conducting the survey, which revealed potential knowledge gaps in a topic not routinely addressed yet crucial to patient quality of life.

Limitations include the lack of survey validation, single-center hospital-based design, small sample size, and inclusion limited to HD nursing staff. Nevertheless, the study provided detailed insight into our nurses' knowledge and practices related to CKD-aP. Including nurses from other dialysis centers or nephrology units might yield different results, so our findings should be interpreted accordingly.

In conclusion, this study has helped us understand the knowledge and routine practices of nursing staff in our dialysis unit regarding CKD-aP. While our nurses demonstrated adequate knowledge, improvements are needed in fostering a proactive diagnostic approach, increased use of specific assessment tools, and updated knowledge of treatment options. Based on our findings, we will consider ongoing education – particularly through workshops – as a key strategy to improve the diagnosis and management of CKD-aP.

## Conflicts of interest

The authors declare no conflicts of interest related to the research, authorship, and/or publication of this manuscript.

## Funding

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## Appendix 1. Questionnaire Used



### TO ANALYZE THE IMPORTANCE OF CHRONIC KIDNEY DISEASE-ASSOCIATED PRURITUS

We would like to understand the current level of knowledge among professionals at our center, CST: Hospital de Terrassa, regarding a symptom that can be disabling for our patients—pruritus associated with CKD. To do so, we invite you to fill out this very short anonymous survey, which will take less than 2 minutes.

The information obtained will be of great interest to all professionals in our society and will help us discover new aspects of this symptomatology.

**1. Sex:**

- a. Male
- b. Female

**2. Age (years):**

**3. Workplace (select ONE):**

- a. Hospital
- b. Dialysis center
- c. Both

**4. How many years of experience do you have in the Nephrology unit?**

**5. Main work areas (multiple options):**

- a. Chronic kidney disease without dialysis
- b. Hemodialysis
- c. Peritoneal dialysis
- d. Kidney transplant

**6. What approximate percentage of your patients do you believe suffer from CKD-associated pruritus?**

- a. 0–10%
- b. 10–20%
- c. 20–40%
- d. 40–60%
- e. >60%

- 7. How do you identify CKD-associated pruritus? (multiple options)**
- a. The patient reports it
  - b. I ask the patient
  - c. Through a scale or questionnaire
  - d. Others (specify): .....
- 8. If you use a scale or questionnaire to diagnose CKD-associated pruritus, indicate which one:**
- a. Verbal Numerical Rating Scale for Itch (NRS-WI)
  - b. Visual Analogue Scale for Itch (VAS-WI)
  - c. Simple Verbal Scale for Itch (EVS)
  - d. Self-assessed Disease Severity Scale (SADS)
- 9. Do you know what advice to give to a patient reporting CKD-associated pruritus?**
- a. Yes
  - b. No
- 10. Which of the following are appropriate recommendations for a patient with CKD-associated pruritus? You may select up to 3 options:**
- a. Avoid scratching and apply cool wet wraps, creams, lotions, or gels
  - b. Skin care (hydration)
  - c. Avoid triggers (tight clothing, high ambient temperature, use of perfumed or alcohol-containing/irritant products)
  - d. Avoid stressful situations, promote relaxation
  - e. Properly follow the CKD dietary plan
- 11. Do you know the causes involved in the pathophysiology of CKD-associated pruritus?**
- a. Yes
  - b. No
- 12. Do you consider CKD-associated pruritus an important symptom that affects the quality of life of kidney patients?**
- a. Yes
  - b. No
- 13. If a patient has pruritus, what is the most widely recommended treatment?**
- a. Moisturizing/anesthetic creams
  - b. Corticosteroids
  - c. Opioid antagonists/agonists
  - d. Gabapentin/pregabalin
  - e. Immunosuppressants
  - f. Antidepressants
- 14. Do you know if there is a specific indicated treatment for CKD-associated pruritus?**
- a. Yes
  - b. No
- 15. Do you think training on the management and diagnosis of pruritus would be useful?**
- a. Yes
  - b. No
- 16. If you answered yes, how would you prefer the training to be delivered?**
- d. Practical workshops
  - e. In-person lecture
  - f. Online course
  - g. Webinar
  - h. Other .....

THANK YOU VERY MUCH FOR YOUR PARTICIPATION



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# Renal Foundation

## Award for Excellence in Communication

### Award Rules

#### PURPOSE

The Renal Foundation is a non-profit organization dedicated to the comprehensive care of individuals with kidney disease, as well as raising awareness and promoting prevention of this condition. As part of its ongoing commitment to quality and excellence, the Renal Foundation has created this award within the framework of the annual congress of the Spanish Society of Nephrology Nursing (SEDEN). The award was established on the occasion of the Foundation's 40<sup>th</sup> anniversary, with the aim of taking a further step in promoting research in nephrology nursing, and recognizing excellence in the communication of presented work, rewarding both the content of the presentation and the quality of its oral delivery during the congress. The first edition took place at the XXXXVIII SEDEN National Congress held in Salamanca (Spain).

#### CANDIDATES

Eligible candidates are nursing professionals or teams whose oral presentations have been accepted for in-person delivery at that year's congress. The 5 highest-scoring oral presentations, as quantitatively evaluated by the SEDEN review panel, will automatically be considered. No work involving members of the Renal Foundation or conducted in any of its centers or dialysis units may participate.

#### EVALUATION CRITERIA

Various aspects of the presentation will be assessed, including:

1. Quality: presentation, structure, and relevance of the content.
2. Clarity: ease of understanding of the delivery.
3. Innovation: originality of format and use of new technologies.
4. Dynamism of the presenter.
5. Impact and connection with the audience.
6. Direct impact on the care of individuals with kidney disease.

#### FINANCIAL ENDOWMENT

This award includes a prize of €1,000 (one thousand euros).

#### DISSEMINATION

The winning work will be made available to the journal *Enfermería Nefrológica* for possible publication, subject to the editorial committee's decision. The Renal Foundation may also disseminate the winning work, without this implying the transfer or limitation of ownership rights over the awarded works, including intellectual or industrial property rights. Whenever authors use the work and/or its data, they must state that it originated as a Renal Foundation Award.

#### JURY

The jury will consist of an odd number of members designated by the SEDEN Board of Directors and the Renal Foundation, with the latter entitled to appoint an additional member to avoid tie votes in the final decision. The award may be declared void.

#### AWARD GRANTING AND PRESENTATION

To receive the award, the work must be presented at the SEDEN National Congress by one of the signing authors. Presentations by individuals who are not listed as authors will not be accepted.

#### ACCEPTANCE OF TERMS

Participation in this call implies acceptance of these terms.

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ENFERMERÍA NEFROLÓGICA

# Analysis of an alternative technique for exit site culture in peritoneal dialysis catheters using pediatric blood culture bottles

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## ABSTRACT

**Introduction:** The identification of the causative microorganism of infection at the peritoneal catheter exit site and the subsequent antibiogram will allow the establishment of appropriate antibiotic treatment aimed at avoiding complications.

**Objective:** To describe a new method used in sample collection for exit site culture, microbiological, epidemiological, and clinical results in patients on peritoneal dialysis.

**Material and Method:** We conducted a descriptive, retrospective, and cross-sectional study, in the Peritoneal Dialysis Unit of Complejo Asistencial Universitario de León (Spain), over a period of 18 years. Adult patients with peritoneal catheters, with equivocal/infected exit sites, and sample collection for culture in pediatric blood culture bottles were included. Sociodemographic variables, catheter dwell time, microorganisms, episodes, peritonitis, and technique cost were collected.

**Results:** A total of 331 patients were studied, with a mean catheter dwell time of  $37.44 \pm 107.06$ . Culture was collected from 171 patients, with 385 positive culture samples. A total of 63% were men, with a mean age of  $59.66 \pm 16.35$  years. A total of 465 microorganisms were identified, with 63 mixed cultures. Gram-positive bacteria, 365; Gram-negative, 86; Yeasts, 14. Peritonitis associated with the microorganism isolated at the exit site 41 resulted in 22 catheter removals.

**Conclusions:** This method has proven to be effective in identifying microorganisms. The most frequent: *S. epidermidis* and *Corynebacterium* spp, highlighting *C. amycolatum* with a multi-resistance profile and a tendency to create biofilm. Although this method is more expensive than the swab, it improves efficacy and performance while promoting the recovery of slow-growing microorganisms, avoiding sample handling and contamination, as well as false negatives in patients on antibiotic therapy.

**Keywords:** chronic kidney disease; peritoneal dialysis; blood culture; microorganisms; peritonitis.

## RESUMEN

**Análisis de una técnica alternativa para el cultivo del orificio de salida en catéteres de diálisis peritoneal utilizando frascos de hemocultivo pediátrico**

**Introducción:** La identificación del microorganismo causal de infección en orificio de salida catéter peritoneal y posterior antibiograma, permitirá instaurar tratamiento antibiótico adecuado dirigido para evitar complicaciones.

**Objetivo:** Describir nuevo método empleado en la recogida de muestras para cultivo del orificio de salida, resultados microbiológicos, epidemiológicos y clínicos en pacientes en diálisis peritoneal.

**Material y Método:** Estudio descriptivo, retrospectivo y transversal, en la Unidad de Diálisis Peritoneal del Complejo Asistencial Universitario de León, en un periodo de 18 años. Se incluyeron pacientes adultos portadores de catéter peritoneal, con orificio de salida equivoco/infectado y recogida de muestra para cultivo, en botella de hemocultivo pediátrico. Se recogieron variables sociodemográficas, tiempo permanencia catéter, microorganismos, episodios, peritonitis y coste de técnica.

**Resultados:** Se estudiaron 331 pacientes, tiempo medio de catéter 37,44±107,06. Se recogió cultivo a 171 pacientes, 385 muestras cultivo positivo. 63% varones, edad media 59,66±16,35 años. Identificados 465 microorganismos, 63 cultivos mixtos. Bacterias Grampositivas 365, Gramnegativas 86, Levaduras 14. Peritonitis asociadas al microorganismo aislado en orificio 41, ocasionando 22 retiradas de catéter.

**Conclusiones:** Este método ha demostrado ser efectivo, en identificación de microorganismos. Los más frecuentes: *S. Epidérmidis* y *Corynebacterium SPP*, destacando *C. Amycolatum* con perfil de multiresistencia y tendencia a crear biofilm. Aunque este método es mas caro que el hisopo, mejora el rendimiento y eficacia, favorece la recuperación de microorganismos de crecimiento lento, evita manipulación muestras y contaminación, evita falsos negativos en pacientes en tratamiento antibiótico.

**Palabras clave:** enfermedad renal crónica; diálisis peritoneal; hemocultivo; microorganismos; peritonitis.

## INTRODUCTION

Exit-site infection (ESI) of the peritoneal catheter is a major complication in peritoneal dialysis, being a risk factor for peritonitis, catheter removal, and technique failure<sup>1</sup>.

The prevention and treatment of ESIs have been a serious concern since the early days of the technique. The International Society for Peritoneal Dialysis (ISPD) first published guidelines in 1983 with recommendations for the prevention and treatment of ESIs associated with the peritoneal catheter and has issued subsequent updates<sup>2</sup>. The recently published recommendations have reduced the infection rate <0.40 episodes/year<sup>1</sup>.

In 1997, Twardowski et al. established a histomorphological classification to standardize criteria regarding the condition of the exit-site (ES), defining seven categories: perfect, good, equivocal, acute infection, chronic infection, external cuff infection, and traumatized<sup>3</sup>.

According to ISPD recommendations, exit-site infection is defined as the presence of purulent discharge, with or without erythema of the skin at the catheter-epidermis interface<sup>4</sup>.

The clinical guidelines of the Spanish Society of Nephrology for the prevention and treatment of peritoneal infection in peritoneal dialysis recommends, with an evidence level of 1C, the monitoring of the peritoneal catheter skin exit-site, establishing early treatment of catheter-associated infections to prevent their progression to peritoneal infection<sup>5</sup>.

Therefore, identifying the causative microorganism and performing subsequent antibiotic susceptibility testing is vital to initiate targeted antibiotic treatment and prevent complications. When no organism is identified after culture of purulent discharge from an ES swab, the diagnosis is negative-culture ESI<sup>1</sup>.

Sample collection is typically performed using a sterile swab. To improve culture yield and reduce the number of negative cultures, an alternative technique has been used that involves inoculating the sample into aerobic/anaerobic blood culture bottles (pediatric bottle).

Our aim was to describe a new method used for collecting exit-site culture samples, presenting the microbiological, epidemiological, and clinical results in peritoneal dialysis patients.

## MATERIAL AND METHOD

**Study design and period:** We conducted a descriptive, retrospective, cross-sectional study at the Peritoneal Dialysis Unit of Complejo Asistencial Universitario de León over an 18-year period, from March 2006 through March 2024.

**Sample:** Inclusion criteria were: adult patients with advanced chronic kidney disease (CKD) carrying a peritoneal catheter, presenting an equivocal/infected ES according to Twardowski's classification, and sample collection performed using aerobic/anaerobic pediatric blood culture bottles. Pediatric patients were excluded.

**Variables:** Sociodemographic and clinical variables were collected: age, sex, catheter dwell time, microorganisms, number of episodes, ESIs associated with peritonitis, and estimated technique cost. ESI was considered the cause of peritonitis when the same organism was isolated from both the ES culture and peritoneal fluid.

**Data collection:** Conducted in the second half of 2024. Data were collected retrospectively, with cut-off points set from March 25, 2006 through March 24, 2024, covering an 18-year study period.

**Sample collection method:** The ES culture collection protocol is as follows:

- Clean the pericatheter area with sterile gauze and 0.9% saline.
- Draw 0.1 mL of saline with a sterile syringe and needle (1 mL syringe with dead-space-free cone).
- Lift the catheter to expose the ES tract.



- Irrigate the ES tract with saline.
- Aspirate the saline, attempting to recover as much as possible.
- Attach a new needle to the syringe and inoculate the sample into a pediatric aerobic/anaerobic blood culture bottle (BACTEC FX, Becton Dickinson). For optimal use, perform multiple rinses with the culture medium.

BACTEC FX is a non-invasive blood culture system that continuously monitors, agitates, and incubates the bottles. When microorganisms are present, they metabolize nutrients and release carbon dioxide (CO<sub>2</sub>). A dye sensor at the bottom of the vial reacts to CO<sub>2</sub>. Photodetectors at each station measure fluorescence levels, which correspond to CO<sub>2</sub> production. The system interprets these readings according to pre-set positivity parameters<sup>6</sup>.

**Data analysis:** Microbiological data were obtained from the clinical microbiology lab software (Servolab, Siemens SA), and epidemiological data from the Versia® software program, with analysis using JASP statistical software. Measures of central tendency and dispersion were calculated for quantitative variables (expressed as means and standard deviations), and absolute frequencies and percentages for qualitative variables.

**Ethical considerations:** No personal data capable of identifying patients directly or indirectly were included, in full compliance with ethical and universal principles, international data protection standards, and current Spanish legislation. The study adhered to the Declaration of Helsinki and took into account applicable ethical and legal guidelines for biomedical research, as per Regulation (EU) 2018/1725 of the European Parliament and Council (October 23, 2018), and Organic Law 3/2018 (December 5), on Personal Data Protection and Digital Rights.

## RESULTS

We studied 331 patients with a mean catheter duration of 37.44±107.06 months. Cultures were collected from 171 patients, 6 of whom had not yet started peritoneal dialysis. A total of 63% were men (n=108) with a mean age of 59.66±16.35 years. A total of 471 samples were collected; 385 tested positive and 86, negative. Of the negative samples, 79 were classified as equivocal ES, and 7 as having clinical signs of ESI. The rate of negative cultures in acute infection ES was 1.78%. In 83 patients, >1 positive culture sample was collected (minimum: 2 – maximum: 16). A total of 465 microorganisms were identified. Sixty-three samples were mixed cultures: 57 had two microorganisms, 4 had 3, and 2 had 4.

Among the microorganisms, 365 were Gram-positive bacteria, with the most common being *Staphylococcus epidermidis* (n=113), *Corynebacterium spp.* (n=97), of which 74.2% were *C. amycolatum*, and *Staphylococcus aureus* (n=63).

There were 86 Gram-negative bacteria, primarily *Pseudomonas aeruginosa* (n=50) and *Escherichia coli* (n=7), and 14 yeasts, with *Candida parapsilosis* (n=12) being the most frequent. Full analysis is shown in **Table 1**.

We identified a total of 41 peritoneal infections associated with the organism isolated from the exit-site: 48.8% were caused by *P. aeruginosa* and 39% by *S. aureus*. Full results are shown in **Table 2**. These peritoneal infections resulted in 22 catheter removals, mostly due to *P. aeruginosa* and *S. aureus*.

Cost analysis comparing the 2 sample collection methods showed the per-sample cost for the blood culture bottle method was €29.49 vs €25.93 for swab collection. Cost breakdown is shown in **Table 3**.

**Table 1.** Isolated Microorganisms.

GRAM-POSITIVE BACTERIA	Count	Percentage
<i>Actinomyces neuui</i>	1	0.215%
<i>BGP</i>	1	0.215%
<i>Brevibacterium paucivorans</i>	1	0.215%
<i>Brevibacterium ravensturnense</i>	2	0.43%
<i>Corynebacterium amycolatum</i>	72	15.484%
<i>Corynebacterium aurimucosum</i>	8	1.720%
<i>Corynebacterium confusum</i>	1	0.215%
<i>Corynebacterium jeikeium</i>	1	0.215%
<i>Corynebacterium minutissimum</i>	4	0.860%
<i>Corynebacterium simulans</i>	1	0.215%
<i>Corynebacterium sp</i>	6	1.290%
<i>Corynebacterium striatum</i>	4	0.860%
<i>Dermabacter hominis</i>	6	1.290%
<i>Enterococcus faecalis</i>	7	1.505%
<i>Enterococcus faecium</i>	1	0.215%
<i>Coagulase-negative staphylococci</i>	4	0.860%
<i>Micrococcus luteus</i>	1	0.215%
<i>Staph. hominis-hominis</i>	8	1.720%
<i>Staphylococcus aureus</i>	63	13.548%
<i>Staphylococcus auricularis</i>	2	0.430%
<i>Staphylococcus capitis</i>	15	3.230%
<i>Staphylococcus epidermidis</i>	113	24.301%
<i>Staphylococcus haemolyticus</i>	9	1.935%
<i>Staphylococcus hominis</i>	6	1.290%
<i>Staphylococcus intermedius</i>	1	0.215%
<i>Staphylococcus lugdunensis</i>	6	1.290%
<i>Staphylococcus pasteurii</i>	1	0.215%
<i>Staphylococcus pettenkoferi</i>	1	0.215%
<i>Staphylococcus schleiferi</i>	1	0.215%
<i>Staphylococcus simulans</i>	4	0.860%
<i>Staphylococcus warneri</i>	9	1.935%
<i>Staphylococcus xylosus</i>	2	0.430%
<i>Streptococcus agalactiae</i>	3	0.645%

GRAM-NEGATIVE BACTERIA	Count	Percentage
<i>Acinetobacter lwoffii</i>	3	0.645%
<i>Enterobacter agglomerans</i>	1	0.215%
<i>Enterobacter asburiae</i>	1	0.215%
<i>Enterobacter cloacae</i>	10	2.151%
<i>Enterobacter ludwigii</i>	1	0.215%
<i>Escherichia coli</i>	7	1.505%
<i>Klebsiella ornithinolytica</i>	1	0.215%
<i>Klebsiella oxytoca</i>	1	0.215%
<i>Klebsiella pneumoniae</i>	1	0.215%
<i>Leclercia adecarboxylata</i>	1	0.215%
<i>Proteus mirabilis</i>	2	0.430%
<i>Proteus vulgaris</i>	1	0.215%
<b><i>Pseudomonas aeruginosa</i></b>	<b>51</b>	<b>10.968%</b>
<i>Serratia liquefaciens</i>	1	0.215%
<i>Serratia marcescens</i>	1	0.215%
<i>Stenotrophomonas (X.) maltophilia</i>	3	0.645%
YEASTS	Count	Percentage
<i>Candida glabrata</i>	1	0.215%
<i>Candida metapsilosis</i>	1	0.215%
<i>Candida parapsilosis</i>	12	2.581%

Table 2. Microorganisms causing Infections.

Microorganismos causantes de IP	N	%
<i>Candida parapsilosis</i>	1	2.44%
<i>Corynebacterium sp</i>	1	2.44%
<i>Escherichia coli</i>	1	2.44%
<b><i>Pseudomonas aeruginosa</i></b>	<b>20</b>	<b>48.8%</b>
<i>Serratia liquefaciens</i>	1	2.44%
<b><i>Staphylococcus aureus</i></b>	<b>16</b>	<b>39%</b>
<i>Staphylococcus lugdunensis</i>	1	2.44%

## DISCUSSION

The method of sample collection by flushing the exit-site peritoneal catheter (ESPC) and subsequent inoculation into a pediatric blood culture bottle (aerobic/anaerobic) proved effective in identifying microorganisms at the ESPC. A similar method was used by Twardowski et al. in 1996 in their validation and classification study of ES, sampling the ES tract for bacteria and cells<sup>7</sup>.

The most frequently isolated microorganisms were *S. epidermidis* and *Corynebacterium spp.*, notably *C. amycolatum* with a multidrug-resistant profile. These organisms, commonly found on skin and mucosa<sup>8</sup>, tend to form biofilms on the catheter lumen, making them difficult to eradicate due to high antibiotic resistance<sup>9,10</sup>. Biofilm-forming bacteria are potential sources of recurrent peritonitis and are

Table 3. Estimated Price of Both Techniques.

Item	Precio estimado	
	Swab (€)	Pediatric Blood Culture Bottle * (€)
Saline 0.9%	0.25	0.25
Swab	0.19	-
Pediatric Blood Culture Bottle	-	3.50
Gloves	0.47	0.47
Insulin Syringe	-	0.13
Needles x 2	-	0.12
Mask	0.02	0.02
Blood Agar Plate	0.37	-
Mannitol Agar Plate	0.25	0.25
Chocolate Agar Plate	0.26	0.26
MacConkey Agar Plate	0.25	0.25
ATB ID**	23.87	23.87
<b>Total</b>	<b>25.93</b>	<b>29.49</b>

\* Pediatric blood culture bottle – aerobic/anaerobic.

\*\* ID ATB: automated identification and antibiotic susceptibility testing system.

linked to high catheter loss rates<sup>11,12</sup>. Other highly prevalent pathogens in our samples were *S. aureus* and *Pseudomonas spp.*, which are more virulent and frequently cause peritoneal infections<sup>4</sup>. In our series, these pathogens were responsible for the majority of peritoneal infections (87.8%), leading to high peritoneal catheter removal rates<sup>13,14</sup>. This result aligns with other studies demonstrating a strong association between ESIs and the development of peritonitis in PD patients, especially with these pathogens<sup>15</sup>.

Many studies support a strong association between ESIs and subsequent peritonitis<sup>16,19</sup>. Therefore, it is reasonable to assume that preventing ESIs and promptly treating infections at the ES and subcutaneous tunnel can reduce peritonitis rates. We found limited literature addressing negative cultures from ES samples. In 2005, Bernardini et al., in a comparative study of ES care with mupirocin vs gentamicin, reported negative culture rates of 0.06 vs 0.03 per year<sup>20</sup>. In 2012, Van Diepen et al. reported an 11.4% rate of negative cultures in ES with infection criteria<sup>21</sup>. In 2021, Sanchidrián et al. reported no negative cultures in ES with clinical signs of ESI<sup>8</sup>. In our study, the rate of negative cultures was low at only 1.78%, supported by a much larger sample size and collection period than previous studies.

According to Akoh JA, in his publication on infections related to peritoneal dialysis, any purulent discharge from the ES should be cultured and Gram-stained<sup>22</sup>. Monitoring and follow-up of the ES are essential for early detection of infection signs. Microbiological evaluation helps implement targeted antibiotic treatment early and avoids underdiagnosing infections by mistaking skin-resident pathogens for contaminants.



Having multiple effective sample collection methods improves microorganism identification, reduces negative cultures, and enables earlier intervention. Some studies suggest early, appropriate antibiotic administration improves outcomes by reducing catheter removal due to peritonitis and lowering mortality risk<sup>23,24</sup>.

Cost analysis showed that while blood culture bottles are slightly more expensive than swabs, they may improve diagnostic performance and efficiency. This method reduces sample handling (thus contamination risk), provides continuous microorganism growth monitoring with automated detection every 10 minutes, and enhances recovery of slow-growing organisms<sup>6</sup>. Additionally, pediatric culture bottles contain antibiotic-binding agents to prevent false negatives in patients on antibiotic treatment<sup>25</sup>.

**Limitations:** This study evaluated microorganism detection using a single technique. Prospective comparative studies between both techniques (blood culture and swab) would be beneficial to assess validity and provide usage recommendations.

**Practical considerations:** Collecting samples in pediatric blood culture bottles may serve as an alternative to swabs as an initial method or second-line option in cases of negative cultures.

In light of our results, we can conclude that this method of blood culture bottle sample collection is effective in identifying microorganisms at the peritoneal catheter ES, reduces the time to detect positive cultures, and may allow earlier targeted antibiotic treatment and prevention of complications.

Although this method is more expensive than swabbing, it may improve performance and diagnostic yield.

## Conflicts of interest

The authors declare no conflicts of interest related to the research, authorship, and/or publication of this manuscript.

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# Utility of a scheduled puncture map of prosthetic vascular access for hemodialysis in daily practice

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## ABSTRACT

**Introduction:** Polytetrafluoroethylene prosthetic fistulas are an alternative when native vascular accesses are not viable. Their use is associated with more complications and lower survival related to repetitive punctures.

**Objectives:** To describe the technique and puncture characteristics of prosthetic fistulas, and analyze the practical utility after the implementation of a scheduled puncture map.

**Material and Method:** We conducted a 6-week prospective, single-center study, with patients with prosthetic fistulas. We analyzed clinical and sociodemographic characteristics, puncture technique, ultrasound parameters, degree of clinical and ultrasound destructure, dialysis characteristics, and vascular access-related complications, after the implementation of a scheduled puncture map.

**Results:** A total of 6 hemodialysis patients with prosthetic fistulas were studied (50% women, 80% humeroaxillary). The mean prosthesis usage time was: 47.1±46.1 months and they had a mean of 2.6±3.4 previous vascular accesses. All patients were punctured in an antegrade direction and with 16G gauge needles. At the end of the 3 study, we increased the percentage of patients with ladder puncture (60 vs 100%) as well as the distance between needles (9.3±1.3 vs 12.3±1.4 cm; p < 0.05), without changes to the analyzed parameters. Throughout the study, 2 patients presented hematomas and extravasations, without other complications.

**Conclusions:** The implementation of a scheduled puncture map allowed us to improve the technique and optimize

the puncture of prosthetic fistulas without any associated complications. We consider the implementation of our scheduled puncture map important in our routine clinical practice.

**Keywords:** vascular access; hemodialysis; polytetrafluoroethylene prosthesis and scheduled puncture map.

## RESUMEN

**Utilidad de un mapa de punción programada del acceso vascular protésico para hemodiálisis en la práctica diaria**

**Introducción:** Las fístulas protésicas de politetrafluoroetileno constituyen una alternativa cuando los accesos vasculares nativos no son viables. Su uso se asocia a más complicaciones y menor supervivencia relacionada con su punción repetitiva.

**Objetivos:** Describir la técnica y características de punción de las fístulas protésicas, y analizar la utilidad práctica tras implementar un mapa de punción programada.

**Material y Método:** Estudio unicéntrico prospectivo de 6 semanas, con pacientes con fístulas protésicas. Analizamos características clínicas y sociodemográficas, técnica de punción, parámetros ecográficos, grado de desestructuración clínica y ecográfica, características de diálisis, y complicaciones relacionadas con el acceso vascular, tras la implementación de un mapa de punción programada.



**Resultados:** Se estudiaron 6 pacientes en hemodiálisis, con fístula protésicas (50% mujeres, 80% húmero axilar). El tiempo medio uso de la prótesis fue:  $47,1 \pm 46,1$  meses y tenían una media de  $2,6 \pm 3,4$  accesos vasculares previos. Todos los pacientes eran puncionados en dirección anterógrada y con agujas de calibre 16G. Al final del estudio incrementamos el porcentaje de pacientes con punción en escalera (60 vs 100%) y un aumento de la distancia entre agujas ( $9,3 \pm 1,3$  vs  $12,3 \pm 1,4$  cm,  $p < 0,05$ ), sin alteraciones en los parámetros analizados. A lo largo del estudio, 2 pacientes presentaron hematomas y extravasaciones, sin otras complicaciones.

**Conclusiones:** la implementación de un mapa de punción programada permitió mejorar la técnica y optimizar la punción de las fístulas protésicas sin complicaciones asociadas. Consideraremos importante la implementación de nuestro mapa de punción programada en la práctica clínica diaria.

**Palabras clave:** acceso vascular; hemodiálisis; prótesis de politetrafluoroetileno y mapa de punción programada.

## INTRODUCTION

Patients with Chronic Kidney Disease (CKD) who require renal replacement therapy through hemodialysis (HD) need an adequate and well-functioning vascular access (VA) that provides appropriate blood flow for optimal treatment efficacy<sup>1,2</sup>.

It is well known that the native arteriovenous fistula (nAVF) has a higher survival rate and fewer complications than other accesses, and should be considered the first choice for vascular access<sup>1-3</sup>. The nAVF is the VA of choice for patients receiving renal replacement therapy via HD, due to its high survival rate and lower rate of complications<sup>1,2,6,7</sup>. Polytetrafluoroethylene prosthetic arteriovenous fistulas (pAVFs) are an effective alternative when native VAs are not viable. Often, cannulation is difficult due to these patients' poor vascular condition and history of failed native VAs, leading to repeated punctures in the same location<sup>2,3</sup>. As a result, their use is associated with more complications such as aneurysmal dilations and prosthetic wall damage, ultimately reducing VA survival<sup>1-3,6</sup>. Therefore, it is crucial to develop strategies that improve cannulation techniques and minimize complications related to vascular access in patients with pAVFs.

A proper cannulation technique is vital for the long-term survival of fistulas. Nurses are primarily responsible for VA cannulation in HD and must learn and develop this skill as best as possible while also being capable of detecting potential complications<sup>6,7</sup>.

Various clinical VA guidelines highlight that the most appropriate cannulation technique for both native and prosthetic fistulas is the stepwise or rotational puncture method, as it better preserves VA integrity and longevity<sup>1,6,7</sup>.

This technique involves punctures along the entire venous pathway or prosthesis, helping to maintain the structural integrity of the VA wall and preventing dilations or aneurysms.

Typically, patients with a pAVF for HD have significant associated comorbidities, poor vascular conditions, and a history of failed native VAs. These factors often complicate the correct cannulation of the PTFE and contribute to structural complications or even thrombosis<sup>2-8,10</sup>.

Given the need to maximize the efficacy and durability of vascular access in these patients, the implementation of a scheduled puncture map (SPM) could represent a significant advancement in clinical practice, offering a structured and systematic guide for cannulation that could improve the long-term survival and performance of pAVFs in HD.

The aim of our study was to describe the cannulation technique and characteristics of pAVFs in our unit and to assess the practical utility of implementing a SPM.

## MATERIAL AND METHOD

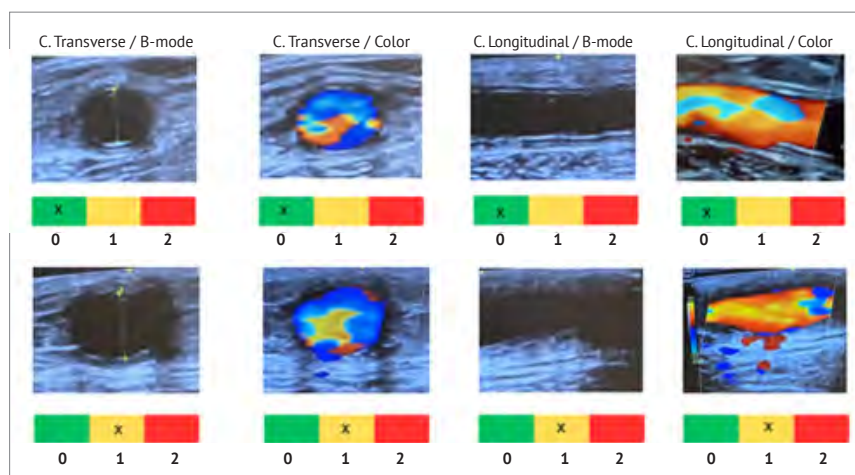
We conducted a single-center, 6-week prospective study. Patients from the Consorci Sanitari de Terrassa (CST) on regular HD and with a normally functioning pAVF for more than 3 months, who gave informed consent, were included. Patients with nAVFs or using catheters as VA for HD were excluded.

We analyzed the main clinical characteristics, sociodemographic data, and history of previous VAs of the included patients. Data were collected regarding the VA cannulation technique: type of puncture, direction, needle gauge and distance between needles, as well as hemostasis time. Additionally, humeral blood flow (Qa) and the arterial and venous diameters at the puncture site of the prosthesis were evaluated using Doppler ultrasound, along with standard dialysis parameters (pump flow, dynamic pressures, recirculation percentage, KT, liters cleared), and various clinical complications related to VA (pain score via VAS, hematomas, extravasations, or thrombosis).

Furthermore, the degree of clinical and ultrasound-based prosthesis deterioration was assessed using custom-designed evaluation scales. Clinical deterioration was evaluated by experienced staff based on visual or palpable signs of structural damage due to repeated use or procedural complications. Three weekly evaluations were averaged. Clinical scores ranged from 0 to 2 (0 = no visible or palpable deterioration, 1 = occasional damaged area, signs of hematoma, hardening, prosthesis enlargement, or small aneurysm, 2 = visibly or palpably deteriorated prosthesis).

Ultrasound-based deterioration was assessed using a proprietary scale evaluating prosthesis condition. It included ultrasound assessment of structural (surface or texture irregularities) and hemodynamic (blood flow abnormalities) changes, as well as the integrity of surrounding tissue.





**Figure 1. Degree of ultrasound disorganization.** Degree of disorganization assessed using a qualitative scale with scores ranging from 0 to 2 (0 = absence of disorganization, 1 = occasionally disorganized area, 2 = disorganized prosthesis), evaluated in both B-mode and color Doppler, in transverse and longitudinal planes.

Four ultrasound zones were defined: distal zone (outside usual arterial puncture sites), habitual arterial puncture zone, habitual venous puncture zone, and proximal zone (outside usual venous puncture sites). Each zone was scored from 0 to 2 (0 = no deterioration, 1 = occasional deterioration, 2 = deteriorated prosthesis) in B-mode and color Doppler, in transverse and longitudinal planes. The total score ranged from 0 to 16 (absent 1–4, mild 5–8, moderate 9–12, severe 13–16) (Figure 1).

At the start, prosthesis appearance and function were analyzed through physical examination and standardized ultrasound, establishing usual puncture zones. All assessments were conducted by the same medical and nursing team throughout the study. Ultrasound evaluations were performed by a single physician. Each patient was assigned to the same nurse for the entire study.

Following this, the SPM was implemented. It consisted of a clockwise rotation cannulation scheme based on the initial ultrasound evaluation. Stepwise cannulation was indicated for all pAVFs. Each session followed the SPM to determine puncture location. If the indicated site could not be used, it was marked and an alternative zone selected. A single nurse ensured correct adherence to the SPM throughout, without changes in cannulation technique (Figure 2).

All variables mentioned earlier were analyzed at the beginning and end of the study.

Descriptive statistical analysis was performed using SPSS version 27. Quantitative variables were expressed as mean and standard deviation. Qualitative variables were expressed as percentages or frequency distribution. The Mann-Whitney U test or Wilcoxon test was used to compare variables. Statistical significance was set at  $p < 0.05$ .

The entire study was conducted in accordance with Good Clinical Practice and the Declaration of Helsinki, with prior approval and institutional guidelines.

## RESULTS

Our HD unit includes a total of 64 prevalent hospital-based patients, divided into daily shifts of 16 patients in the morning and afternoon from Monday through Saturday.

During the study period, a total of 6 patients with pAVFs were included. Table 1 shows the main clinical and demographic characteristics. The main cause of CKD in 3 patients (50%) was diabetic nephropathy. Half were women (3 patients, 50%) and half men. Their mean age was  $66.1 \pm 15.1$  years, with a mean of  $78.1 \pm 73.4$  months on HD. The mean Charlson Index was  $10.1 \pm 2.6$  points. Hypertension was the main cardiovascular risk factor in 5 patients (83%). Two patients (33%) were on antiplatelets and 1 (17%) on anticoagulants.

In 4 patients (80%), the prosthesis was located in the humero-axillary region. The mean use duration of the prosthesis was  $47.1 \pm 46.1$  months, with a mean of  $2.6 \pm 3.4$  previous VAs. All patients underwent antegrade needle punctures using 16G needles.

At the end of the study, stepwise puncture use increased from 4 to 6 patients (60% to 100%), with a significant increase in the distance between needles ( $9.3 \pm 1.3$  cm vs.  $12.3 \pm 1.4$  cm,  $p < 0.05$ ), without changes in clinical ( $0.81 \pm 0.9$  vs.  $0.83 \pm 0.9$ ) or ultrasound deterioration ( $6.2 \pm 5.7$  vs.  $6.3 \pm 5.6$ ), hemos-

Baseline	Tuesday	Thursday	Saturday
Week 1			
Week 2			
Week 3			
Week 4			
Week 5			
Week 6			

**Figure 2. Scheduled puncture map.**

**Table 1.** Main Clinical and Demographic Characteristics of the Patients.

PACIENTE	EDAD	FACTORES DE RIESGO	SEXO	TIEMPO EN HD	ETIOLOGÍA ERC	LOCALIZACIÓN PTFE	AV PREVIOS	MESES USO PTFE
1	56	DM, HTN	M	31	DM	HUMERAL	1	55
2	49		M	360	CKD-TIN	FEMORAL	9	171
3	72	DM, HTN	M	6	UNDEFINED	HUMERAL	0	10
4	55	DM, HTN, ASA	M	24	DM	HUMERAL	2	34
5	88	HTN, IHD, ASA	M	88	HTN	FEMORAL	4	72
6	64	DM, HTN, IHD, OAC	M	13	DM	HUMERAL	0	28

**Main Clinical and Demographic Characteristics of the Patients:** Age (years); DM: diabetes mellitus; HTN: hypertension; ASA: acetylsalicylic acid; IHD: ischemic heart disease; OAC: oral anticoagulants; M: male; F: female; HD time in months; CKD-TIN: chronic tubulointerstitial nephropathy.

tasis time ( $15.1 \pm 2.5$  vs.  $17.4 \pm 3.4$  minutes), pain level (VAS  $1.2 \pm 1.4$  vs.  $1.1 \pm 1.2$ ), or humeral flow (Qa  $1671.3 \pm 496.2$  vs.  $1605.8 \pm 579.1$  mL/min).

No significant changes were observed in dialysis parameters (start vs. end): blood flow (Qb  $390 \pm 20.3$  vs.  $391 \pm 20.4$  mL/min), dynamic arterial pressure (DAP  $218 \pm 13.4$  vs.  $221 \pm 12.9$  mmHg), venous pressure (VP  $247 \pm 10.6$  vs.  $250 \pm 25.5$  mmHg), dialysis dose (Kt  $48.5 \pm 2.9$  vs.  $49.7 \pm 3.7$ ), recirculation percentage (Rc  $13.2 \pm 1.2$  vs.  $13.1 \pm 2.7\%$ ), and liters of blood cleared ( $88.8 \pm 3.2$  vs.  $90.9 \pm 3.1$ ).

Two patients developed hematomas and extravasations. No episodes of prosthesis thrombosis were reported

## DISCUSSION

Our results show that implementing an SPM can improve cannulation technique in pAVFs without compromising vascular access durability or HD therapy effectiveness. Furthermore, it offers safety, as no major VA-related complications occurred during the study period.

After a comprehensive literature review, we found no published studies on the use of SPMs in routine clinical practice, making it difficult to compare our results. Unfortunately, the potential advantages of buttonhole cannulation in terms of hematomas, extravasations, or aneurysm formation have not been evaluated in prosthetic VAs, as current guidelines recommend stepwise cannulation and suggest puncture diagrams to preserve functionality and avoid complications<sup>1,11,12</sup>. Other strategies, such as digital VA monitoring, ultrasound-guided puncture, or AI-based puncture programs, may help detect thrombosis-risk events earlier<sup>13,15</sup>.

Based on our findings, this cannulation strategy for prosthetic VAs can be a useful daily tool for optimizing management and improving efficacy and survival of vascular accesses. Therefore, we plan to implement the SPM in our unit's routine clinical practice.

Additionally, our results provide valuable information about the cannulation technique and characteristics of pAVFs in our unit.

We succeeded in improving the technique, ensuring that by study end, all prostheses were cannulated using the stepwise technique. We also significantly increased puncture length without associated complications. These results should, in theory, help preserve VA integrity and reduce complications. However, we cannot provide long-term patency and survival data due to the short follow-up period.

Puncturing pAVFs in "native" segments, as guided by ultrasound per our SPM, was safe and effective. This is supported by the lack of significant changes in prosthesis clinical or ultrasound deterioration, hemostasis time, pain level, humeral flow, or standard dialysis parameters. No thromboses occurred, though some patients did experience minor complications like hematomas and extravasations – common in daily practice<sup>1</sup>–linked to initiating puncture in newly evaluated native segments.

Of note, importance of accurate ultrasound evaluation in difficult VA cannulations, allowing alternative sites beyond habitual zones in pAVFs. Nursing staff should be proficient in routine VA ultrasound and further their knowledge of ultrasound-guided cannulation<sup>16</sup>, especially in complex cases.

The main strength of our study lies in its innovative nature and ease of implementation in daily clinical practice using rigorous methodology. In our view, the SPM could be integrated into any HD unit with minimal requirements.

Regarding the study's limitations, it is worth mentioning its single-center nature and the small sample size, which was limited by the current number of AV grafts in our unit. However, this single-center approach allowed for greater rigor in the methodology used. Similarly, the short study period did not allow for the analysis of data related to survival or other complications over a longer timeframe. Finally, the lack of validated scales for assessing prosthesis deterioration may influence our results, although we did not

find any standardized scales in the literature focused on the deterioration of prosthetic AV accesses. Therefore, our results should be interpreted with caution, as they are based solely on our experience and exclusively on this type of vascular access. Studies with better designs are needed to establish more robust conclusions. Nevertheless, this work can serve as an initial point for the development of future studies to assess the long-term utility of a SPM in prosthetic AV accesses.

In conclusion, the results of this study suggest that the implementation of an SPM can improve the puncture technique in grafts, without compromising the durability of the vascular access or the effectiveness of HD therapy. This strategy can be considered a useful tool in daily clinical practice to maximize the effectiveness and survival of vascular accesses.

These findings are promising and support the consideration of implementing SPM in daily clinical practice. However, further research is needed to confirm these results and evaluate the long-term utility of SPM.

### Conflicts of interest

The authors declare no conflicts of interest related to the research, authorship, and/or publication of this manuscript.

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# Renal transplanted woman with amputation, calciphylaxis, and Monckeberg's sclerosis: a case report

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## ABSTRACT

**Case description:** 40-year-old woman with a past medical history of diabetes, hypertension, and chronic kidney disease. She becomes the recipient a deceased donor kidney transplant and 2 years later begins with signs of arterial insufficiency, being diagnosed with calciphylaxis and Mönckeberg's sclerosis. Conservative management is provided, however, given the unfavorable evolution, left hand disarticulation is decided.

**Care Plan Description:** The patient's needs were identified, pain level was controlled with IV analgesia and a buprenorphine patch. A thorough assessment was performed to timely identify any signs of peripheral tissue perfusion and surgical wound infection. Given the body image disorder, activities were conducted to enhance her self-esteem.

**Plan Evaluation:** The patient's response to the interventions was evaluated, she reported mild pain. Since there were no signs of surgical wound infection, recommendations were provided to enhance the patient's self-esteem.

**Conclusions:** Multidisciplinary management in which the nursing professional is actively involved is crucial in the management of these patients to improve their quality of life.

**Keywords:** chronic kidney disease; calciphylaxis; Monckeberg's medial calcific sclerosis; nursing care plans.

## RESUMEN

**Mujer trasplantada renal con amputación, calcifilaxis y enfermedad de Monckeberg: a propósito de un caso**

**Descripción del caso:** Mujer de 40 años con antecedentes de diabetes, hipertensión arterial y enfermedad renal crónica. Recibe trasplante renal de donador fallecido y dos años después, comienza con datos de insuficiencia arterial, diagnosticándose calcifilaxis y enfermedad de Mönckeberg. Se brinda manejo conservador, sin embargo, ante la evolución no favorable se decide realizar desarticulación de mano izquierda.

**Descripción del plan de cuidados:** Se identificaron las necesidades de la paciente, se controló el nivel de dolor mediante analgesia intravenosa y parche de buprenorfina. Se realizó una valoración exhaustiva para identificar de manera oportuna datos de perfusión tisular periférica y de infección de herida quirúrgica. Dado el trastorno de la imagen corporal se realizaron actividades para potenciar su autoestima.

**Evaluación del plan:** Se evaluó la respuesta de la paciente a las intervenciones, se refirió con dolor leve, no se presentaron datos de infección de herida quirúrgica, se brindaron recomendaciones para la potenciación de la autoestima.

**Conclusiones:** El manejo multidisciplinario donde participa de manera activa el profesional de enfermería es crucial en la atención de estos pacientes, a fin de contribuir a una mejora en su calidad de vida.

**Palabras clave:** enfermedad renal crónica; calcifilaxis; esclerosis calcificante de la media de Monckeberg; planes de atención en enfermería.

## INTRODUCTION

Calciophylaxis is a clinical syndrome characterized by necrotic ulceration of the skin due to calcification of the tunica media and fibrosis of the arteriolar intima, followed by thrombosis of the subcutaneous microcirculation. Given its association with chronic kidney disease (CKD), it is also described as uremic calcific arteriolopathy<sup>1</sup>, although it can affect individuals with normal or mildly impaired renal function, including kidney transplant recipients<sup>2</sup>.

Calciophylaxis has a multifactorial etiology. Non-modifiable risk factors include time on renal replacement therapy (RRT), female sex, and diabetes. Among the most relevant modifiable factors are hyperphosphatemia, use of high doses of phosphate binders, treatment with vitamin D analogues, hyperparathyroidism, and anticoagulation with vitamin K antagonists<sup>1</sup>.

On the other hand, Mönckeberg's arteriosclerosis is described as calcification of the tunica media of medium- and small-caliber muscular arteries of the limbs, such as the femoral, popliteal, and radial arteries<sup>3,4</sup>. It is a condition of unknown origin, mainly associated with age, diabetes, and CKD<sup>5,7</sup>. Its clinical manifestations depend on the resulting vascular occlusion, and diagnosis is often incidental through histopathological samples. Therefore, clinical suspicion is the cornerstone for early management to avoid accelerated disease progression<sup>6</sup>. In terms of nursing care, timely diagnosis is necessary to develop a specialized care plan that truly meets the needs of our patients.

The following is the nursing process for a female kidney transplant recipient with a hand amputation, who presented with calciophylaxis and Mönckeberg's arteriosclerosis—both rare but rapidly progressive and potentially fatal entities. The importance of nursing care is highlighted, having contributed to improved well-being in a patient with not only physiological but also emotional needs due to deterioration of her health status.

## CASE PRESENTATION

A 40-year-old woman with a past medical history of type 1 diabetes mellitus and hypertension diagnosed at age 16. In 2016, she was diagnosed with CKD stage G5, and in 2022, she received a kidney transplant from a deceased donor. In March 2024, she underwent digital tip remodeling of the third finger bilaterally due to necrosis with bone exposure. The wounds healed favorably at the level of the middle phalanx stumps of both third fingers.

In May 2024, she presented with necrosis and soft tissue infection extending proximally 1–1.5 cm from the middle phalanx stump of the left hand's third finger. Erythema involved the rest of the finger, extending to the dorsum and palm of the hand. Disarticulation of the second phalanx of the middle finger on the left hand was performed.

During this hospital admission, the patient developed acute renal graft dysfunction secondary to a complicated urinary tract infection, with creatinine at 2.8 mg/dL. Urinalysis showed 30 mg/dL of protein, uncountable leukocytes, and abundant bacteria. Following antibiotic treatment, serum creatinine decreased to baseline levels of 1.1–1.3 mg/dL.

In June 2024, the patient presented with secondary hyperparathyroidism and glycemic decontrol. Severe arterial calciophylaxis of the upper limbs was diagnosed with the following labs: potassium 4.5 mmol/L, calcium 8.3 mg/dL, phosphorus 4.5 mg/dL, and glycated hemoglobin (HbA1c) 12%. Physical examination revealed necrosis of the 2nd and 4th fingers of the left hand, and a deep dorsal wound with bone and tendon exposure. The patient was not a candidate for free flap reconstruction due to insufficient local or regional tissue. The wound was managed with specialized dressings at a wound care clinic.

A biopsy of the radial artery in the left arm was performed, and Doppler imaging showed early signs of distal arterial insufficiency. In July 2024, she was diagnosed with Mönckeberg's disease, and underwent debridement of the left hand dorsum. However, due to poor evolution, disarticulation of the left hand was performed. The patient was discharged with outpatient follow-up.

## NURSING ASSESSMENT

In the week prior to hospital discharge, the patient appeared older than her chronological age, with a depressed facial expression, and poor body integrity and symmetry. **Table 1** presents the assessment based on the nursing domains of the North American Nursing Diagnosis Association (NANDA-I).

## NURSING CARE PLAN

The patient's priority human needs were identified, and a care plan was developed using the NANDA-I<sup>8</sup>, Nursing Outcomes Classification (NOC)<sup>9</sup>, and Nursing Interventions Classification (NIC)<sup>10</sup> taxonomies (**Table 2**).

### Evaluation of the care plan

Patient response to interventions was periodically evaluated, with the last follow-up before hospital discharge. The following are the results of that evaluation:

- **Acute pain:** Managed in coordination with the pain management team for somatic and neuropathic pain. The patient reported mild pain (2 on the Visual Analog

**Table 1.** Assessment According to the NANDA Nursing Domains.

Nursing Domains	Significant Data
Health Promotion	Lives in an urban area, has access to water, electricity, and sewage; no overcrowding, no drug use.
Nutrition	Weight: 62.2 kg; Height: 161 cm; BMI: 24.8 kg/m <sup>2</sup> . Weekly Nutritional Intake at Home; Fruits: 0 out of 7 days; Vegetables: 7 out of 7 days; Meats: 3 out of 7 days; Dairy products: 0 out of 7 days; Sugary beverages: 0 out of 7 days; Water intake: 2.5–3 liters per day
Elimination	No acute renal graft dysfunction.
Activity and Rest	Vital signs: blood pressure 110/75 mmHg, heart rate 86 bpm, respiratory rate 19 rpm, O <sub>2</sub> saturation 95% in ambient air. Leads a sedentary lifestyle, performs household chores during the day.
Perception/Cognition	Alert, cooperative, oriented in all three spheres.
Self-Perception	Acknowledges being in a deteriorated state of health.
Role/Relationships	Homemaker, single mother with two teenage children. Main support network: her parents and children.
Sexuality	Underwent total hysterectomy in 2019 due to abnormal uterine bleeding.
Coping/Stress Tolerance	Reports a positive attitude and maintains hope for improvement.
Life Principles	States that her beliefs do not interfere with health care.
Safety/Protection	Left upper limb bandaged; supradial-ulnar amputation; at risk of infection due to immunosuppressed state.
Comfort	Moderate pain in the left hand, measured at 6 on Visual Analogue Scale; controlled with IV analgesics and buprenorphine patch.
Growth/Development	Patient with chronic degenerative diseases and vascular complications.

Scale), allowing her to perform activities with some restrictions but no major complications.

- **Risk of surgical wound infection:** Left hand stump showed no discoloration, no signs of infection, and adequate healing. Patient followed by endocrinology for glycemic control.
- **Risk of ineffective peripheral tissue perfusion:** No edema in limbs, 3-second capillary refill, rhythmic and weak peripheral pulses in the lower extremities.
- **Risk of situational low self-esteem:** Patient expressed calmness and enthusiasm about returning home. She displayed a positive attitude and willingness to follow instructions to improve her current health condition. She had an open appointment for psychological follow-up.

## DISCUSSION

Calciophylaxis in patients with CKD is rare but has a 1-year mortality of up to 60–80%, mainly due to skin-derived sepsis<sup>11,12</sup>. In renal transplant recipients, a vigilant attitude is necessary since, despite the resolution of uremia, vascular calcification and its complications may still develop due to

other risk factors<sup>1</sup>. This is especially relevant in our case, where the patient experienced rapid vascular complications in < 6 months.

This clinical scenario requires a multidisciplinary approach addressing 3 therapeutic axes: **a)** medical-surgical management of lesions to prevent progression to sepsis<sup>13</sup>; **b)** modification of all possible precipitating factors of ectopic calcification; and **c)** use of tools to inhibit the cutaneous calcification process<sup>1</sup>.

Our patient also had Mönckeberg's arteriosclerosis, which is increasingly recognized in CKD patients. However, its clinical significance is often underestimated. Notably, its presence increases the risk of peripheral vascular disease and limb amputations<sup>6</sup>. Therefore, in patients with risk factors and clinical suspicion, tissue biopsy should be performed to confirm the diagnosis<sup>14</sup>.

This case study contributes to scientific knowledge by presenting the progression of two rare pathological entities –calciophylaxis and Mönckeberg's arteriosclerosis– that may become increasingly prevalent due to the rising number of CKD patients requiring RRT. Addressing this case also highlights the contribution of nursing professionals in providing comprehensive care, considering the patient as a

**Table 2.** Nursing Care Plan with NANDA, NOC, NIC Taxonomies.

NANDA Nursing Diagnosis	NOC Outcome Indicators	NIC Interventions and Activities
<b>00132.</b> Acute pain related to biological damaging agents as evidenced by expressive behavior, facial expression of pain, and verbal report.	<b>1605.</b> Pain Control. <b>Indicators:</b> <b>160502.</b> Recognizes the onset of pain. <b>160503.</b> Uses preventive measures. <b>160511.</b> Reports controlled pain.	<b>1400.</b> Pain Management: Acute <b>Activities:</b> - Perform a thorough pain assessment. - Ensure the patient receives analgesic care. <b>2210.</b> Administration of Analgesics <b>Activities:</b> - Monitor vital signs before and after administering narcotic analgesics. - Provide a comfortable environment and other relaxation-promoting activities.
<b>00266.</b> Risk of surgical wound infection Associated conditions: Diabetes mellitus. Immunosuppression.	<b>1924.</b> Risk Control: Infectious Process. <b>Indicators:</b> <b>192426.</b> Identifies infection risk factors. <b>192405.</b> Identifies signs and symptoms of infection. <b>192407.</b> Identifies strategies to protect self from others. <b>1102.</b> Wound Healing: Primary Intention. <b>Indicator:</b> <b>110213.</b> Wound edge approximation.	<b>6550.</b> Infection Protection <b>Activities:</b> - Monitor complete blood count. - Provide appropriate skin care. - Inspect for erythema, excessive heat, or discharge on skin and mucous membranes. - Encourage adequate fluid intake and sufficient nutrition. - Teach the patient to take antibiotics as prescribed.
<b>000228.</b> Risk of ineffective peripheral tissue perfusion related to inadequate knowledge of modifiable factors, sedentary lifestyle.	<b>0407.</b> Tissue Perfusion: Peripheral. <b>Indicators:</b> <b>040712.</b> Peripheral edema. <b>040715.</b> Capillary refill of fingers. <b>040729.</b> Necrosis.	<b>4040.</b> Circulatory Precautions. <b>Activities:</b> - Perform a thorough assessment of peripheral circulation. - Instruct the patient on proper skin care and the importance of good glycemic control.
<b>00153.</b> Risk for situational low self-esteem related to body image disturbance, stressors. Associated condition: Physical illness.	<b>2302.</b> Adaptation to Physical Disability. <b>Indicators:</b> <b>130808.</b> Identifies ways to cope with life changes. <b>130820.</b> Reports increased psychological well-being.	<b>5400.</b> Self-Esteem Enhancement <b>Activities:</b> - Encourage the patient to identify personal strengths. - Express confidence in the patient's ability to manage a situation. - Make positive affirmations about the patient.

bio-psycho-social being, thus improving the quality of care for this patient group.

In conclusion, while kidney transplantation helps manage bone and mineral metabolism disorders in CKD, a combination of risk factors can still predispose patients to vascular complications, increasing morbidity and mortality<sup>45</sup>. A multidisciplinary approach, with active involvement of nursing professionals, helps improve the quality of life for CKD patients by meeting therapeutic goals and addressing their individual needs.

### Conflicts of interest

The authors declare no conflicts of interest related to the research, authorship, and/or publication of this manuscript.

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# Ultrasound and fistula catheter: a strategy to reduce vascular access injuries

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## ABSTRACT

The use of ultrasound has been shown to improve knowledge of vascular access, facilitating the choice of puncture sites and increasing confidence in difficult punctures. With the aging of the hemodialysis population, vascular deterioration complicates access to the native arteriovenous fistula, thus increasing the risk of complications such as hematomas, thrombosis, and stenosis. These difficulties can lead to the use of central venous catheters, increasing morbidity and mortality.

Conventional metal needles can damage the native arteriovenous fistula, reducing its longevity. As an alternative, the fistula catheter minimizes vascular damage by reducing the risk of extravasations and hematomas. This study compared both types of needles in 12 patients for 8 months (2 were excluded due to death, leaving 10 patients that were categorized into 2 groups). Ultrasounds were performed to evaluate vascular involvement.

Results showed that 80% of patients with conventional metal needles presented injuries, while only 40% of the fistula catheter group developed damage, which resolved during the study. No significant changes in native arteriovenous fistula flow were observed in either group.

Ultrasound monitoring allowed changes to puncture sites to prevent long-term complications. It is concluded that the use of fistula catheters, along with ultrasound and trained personnel, can reduce complications and prolong the life of vascular access, avoiding unnecessary surgical procedures and improving the quality of hemodialysis treatment.

## RESUMEN

### Ecografía y catéter fístula: una estrategia para reducir lesiones en el acceso vascular

El uso de ecografía ha demostrado mejorar el conocimiento del acceso vascular, facilitando la elección de zonas de punción y aumentando la confianza en punciones dificultosas. Con el envejecimiento de la población en hemodiálisis, el deterioro vascular complica el acceso a la fístula arteriovenosa nativa, incrementando el riesgo de complicaciones como hematomas, trombosis y estenosis. Estas dificultades pueden llevar al uso de catéteres venosos centrales, aumentando la morbimortalidad.

Las agujas metálicas convencionales pueden causar daño en la fístula arteriovenosa nativa, reduciendo su longevidad. Como alternativa, el catéter fístula minimiza el daño vascular al reducir el riesgo de extravasaciones y hematomas. Este estudio comparó ambos tipos de agujas en 12 pacientes durante 8 meses. Se excluyeron 2 por defunción, dejando 10 pacientes divididos en dos grupos. Se realizaron ecografías para evaluar la afectación vascular.

Los resultados mostraron que el 80% de los pacientes con aguja metálica convencional presentaron lesiones, mientras que solo el 40% de los del grupo catéter fístula desarrollaron daños, los cuales se resolvieron durante el estudio. No se observaron cambios significativos en el flujo de la fístula arteriovenosa nativa en ninguno de los grupos.

El control ecográfico permitió modificar zonas de punción para prevenir complicaciones a largo plazo. Se concluye que el uso de catéter fístula, junto con la ecografía y personal capacitado, puede reducir complicaciones y prolongar la vida del



acceso vascular, evitando intervenciones quirúrgicas innecesarias y mejorando la calidad del tratamiento en hemodiálisis.

### To the Editor

We would like to contribute our knowledge and experience with the use of ultrasound, as well as with catheter fistula (CF) needles as an alternative to conventional metal needles. According to our experience, by switching to these needles and thanks to ultrasound guidance by nursing staff, we have been able to avoid or prevent possible complications, reducing the injuries caused by cannulation.

It has been studied that the use of ultrasound by nurses improves knowledge of the vascular access (VA), assists in the selection of cannulation sites, and increases nursing confidence in new or difficult VAs<sup>1</sup>.

In recent years, the profile of patients starting renal replacement therapy (RRT) on hemodialysis (HD) has changed, with a significant increase observed in patients over 75 years of age. These patients have increased age and morbidity, which can complicate access to a native arteriovenous fistula (nAVF) due, among other factors, to age-related vascular deterioration<sup>2</sup>.

As a result, cannulation can be more complex, increasing the risk of complications such as infiltrations, hematomas, repeated punctures, stenosis, thrombosis, and aneurysms. This not only causes discomfort for the patient but also increases the workload of healthcare personnel. In some cases, these difficulties may necessitate the placement of a central venous catheter (CVC), which carries a higher risk of morbidity and mortality<sup>2</sup>.

The repeated use of conventional metal needles in HD can cause vascular damage to the nAVF. This damage can be a key factor affecting VA longevity. Moreover, arm movement or flexion during dialysis may contribute to this damage<sup>3,4</sup>.

The alternative to conventional metal needles is the CF needle, which consists of a biocompatible cannulation device made of an internal metal needle and an external plastic fluoropolymer catheter. The latter remains inside the vessel during treatment. The plastic cannula minimizes damage to the vessel wall, risk of extravasation, and the development of hematomas<sup>3</sup>.

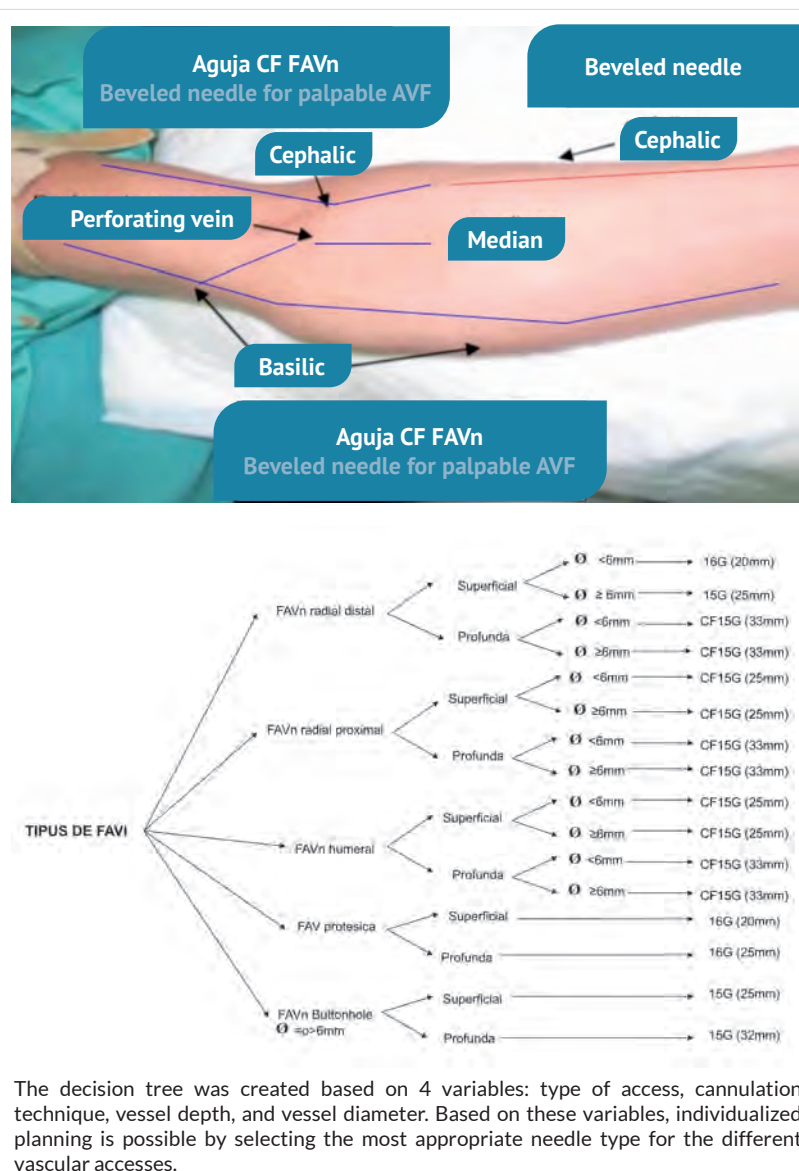
Using ultrasound to monitor the VA in dialysis units allows for individualized

cannulation, which may lead to improved outcomes and greater VA longevity<sup>5</sup>.

In recent years, nurses have been trained in the use of vascular ultrasound as a work tool, helping to improve knowledge of the VA, selecting cannulation sites, and increasing confidence when accessing new or difficult VAs.

Currently, in our center we use both types of needles, selecting the material based on the unit's internal cannulation guide: "Guide for Selecting Cannulation Material for nAVF/pAVF" (Figure 1).

In this study, we compared conventional metal needles versus CF needles over a period of 8 months, in different patients with similar anatomical conditions, to determine



The decision tree was created based on 4 variables: type of access, cannulation technique, vessel depth, and vessel diameter. Based on these variables, individualized planning is possible by selecting the most appropriate needle type for the different vascular accesses.

**Figure 1.** Guide for the selection of puncture material for AVF n/p.

which material is more optimal for minimizing vascular wall damage. To do this, nurses performed ultrasound monitoring, observing the appearance of vascular wall injuries as well as fistula function.

Our objective was to assess, via ultrasound, the impact on the posterior wall of the nAVF related to the choice of cannulation material (metal needle vs. CF needle).

We included a total of 12 patients with radiocephalic nAVFs, with arterial and venous cannulation segments of at least 4 cm, using a rope-ladder technique. Patients were randomly divided into two groups: 6 with conventional metal needles and 6 with CF needles. Two were excluded due to death. The study was completed by 10 patients –5 with metal needles and 5 with CF needles.

Each of the 10 patients underwent a baseline ultrasound, confirming no preexisting lesions in the cannulation areas. At the end of the study, a morphological and functional Doppler ultrasound was performed.

During the study, a session log sheet was completed detailing any cannulation issues, hematoma appearance, etc.

Each month, an ultrasound was performed to assess whether any new lesions had appeared in the nAVF vessel, and findings were recorded.

At the end of the study period, among the 5 patients with conventional metal needles, 4 presented with lesions (80%): 3 in the posterior wall and 1 in the anterior wall.

The latter was due to a cannulation problem that caused a superficial hematoma. Lesions appeared during the first, fourth, and fifth months and persisted until the end of the study.

Among the 5 patients with CF needles, 2 presented with lesions (40%), both in the posterior wall. These appeared in months 2 and 5 and resolved during the course of the study.

There were no significant changes in nAVF flow measurements before and after the study in either group.

CF needles caused fewer vascular wall injuries compared to conventional metal needles.

Vessel wall injuries occurred mostly in the posterior wall, and those in the CF group resolved by the end of the study. In contrast, the injuries caused by metal needles persisted.

Monthly ultrasound monitoring of the nAVF allowed us to change cannulation sites when posterior wall injuries were detected, helping to avoid long-term problems such as stenosis, which is the main issue leading to nAVF dysfunction. All these tools could help prolong the life of nAVFs, avoiding surgical interventions like angioplasty, superficialization of the nAVF, and placement of CVCs in cases of nAVF dysfunction.

In this study, nurses were responsible for monitoring and recording patients' VAs, detecting injuries or dysfunctions early through physical and ultrasound examination. This enhances nursing empowerment, allowing them to anticipate complications and improve VA survival.

Based on our results, we can observe that having access to a variety of cannulation needles –especially CF needles– as well as having a specific guide for choosing materials for nAVFs and prosthetic AVFs (pAVFs), using proper cannulation techniques, having an ultrasound device, and having trained professionals can all support individualized cannulation. This individualization may help reduce the number of complications, such as extravasation or infiltration of the vascular access wall during cannulation. However, it is important to note that while these factors appear to have a positive impact, further studies are needed to confirm and quantify their effect on complication reduction.

Vascular damage associated with needle use in HD is a significant concern. The implementation of appropriate techniques and continuous monitoring are essential to preserve VA function and ensure effective treatment.

### Conflicts of interest

The authors declare no conflicts of interest related to the research, authorship, and/or publication of this manuscript.

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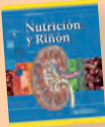
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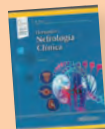
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**Enfermedad Renal Crónica Temprana (eBook Online)**  
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work to be accepted for publication in a section of the journal. This will include completing the **publication agreement form**, vouching for the submission's originality and providing assurances that it has not been published elsewhere.

Submissions will be accepted in word format, one in which the author is identifiable, and the other which is anonymous for peer review. Pages must be DIN-A4 sized, double-spaced and with size-12 font, with 2.5-cm top, bottom and side margins. Pages will be numbered consecutively. Headings, footnotes and highlighting are not recommended, as they can cause problems with layout should the submission be published.

Enfermería Nefrológica's management tool will acknowledge the receipt of all submissions. Once receipt has been acknowledged, the editorial process starts, which can be followed by authors via the aforementioned platform.

Submissions must comprise three files to be uploaded onto the journal's OJS platform.

#### File 1:

- ▮ Letter of presentation that accompanies the submission.
- ▮ Publication agreement form, content liability and assurance that it has not been published elsewhere.

#### File 2:

- ▮ Full submission (including tables and appendices) with name of author(s).

#### File 3:

- ▮ Full submission (including tables and appendices) with no identifying details of author(s).

The ethical responsibility section must be accepted before the files can be submitted.

The original submissions must adhere to the following presentation guidelines:

**First page.** This begins with the article title, authors' full names and surnames, work centres, countries or origin, email addresses and ORCID number (unique researcher ID). Indicate which author any correspondence is to be addressed to, as well as whether the surnames of the authors are to be joined by a hyphen or just one surname is to be used.

**Summary.** All articles must include a summary (in the original language and in English). This is to be a **maximum** length of **250 words**. The summary must contain sufficient information so that readers can gauge a clear idea of the article's content, without any reference to the text, bibliographical references or abbreviations and follow the same sections as the text: introduction, objectives, methodology, results and conclusion. The summary will not contain any new information not contained within the text itself.

**Keywords.** Some 3-6 keywords must be included at the end of the summary, which are directly related to the main study principles (advisable to use DeCS controlled vocabulary vocabulary <https://decs.bvsalud.org/es/> and MeSH <https://www.ncbi.nlm.nih.gov/mesh>).

**Text.** In observational or experimental submissions, the text is usually divided into sections or the following: **Introduction**, which must provide the necessary items to understand the work and include its objectives.

**Method** employed in the research, including the centre where the research was conducted, its duration, characteristics of the series, sample selection criteria, techniques employed and statistical method. **Results**, which must provide data and not comment or discuss it. Results must exactly answer the objectives set out in the introduction. Tables and/or figures can be used to supplement information, although superfluous repetitions of results that are already included in the tables must be avoided, focusing instead on only the most relevant information. In the **Discussion** the authors must comment on and analyse the results, linking them to those obtained in other

studies that are bibliographically referenced, as well as any conclusions they have reached with their work. The **Discussion** and **Conclusion** must stem directly from the results, with no statements made that are not validated by the results obtained in the study.

**Acknowledgements.** Should they wish to, authors may express their gratitude to anyone or any institution that has helped them to conduct their research. This section should also be used to acknowledge anyone who does not meet all of the criteria to be considered as an author, but who has helped with the submission, such as those who have helped with data collection, for example.

**Statement on the use of generative Artificial Intelligence (AI) in scientific writing.** AI and AI-assisted technologies should not be listed as author, co-author, or cited as author. Authorship implies responsibilities and tasks that can only be attributed to and performed by humans. If it has been used, authors should include a paragraph before the bibliography reporting the use of AI: "During the preparation of this paper, the authors used [NAME TOOL/SERVICE] for [REASON]. After using this tool/service, the authors reviewed and edited the content as necessary and take full responsibility for the publication's content". This statement does not apply to using essential tools to check grammar, spelling, bibliographic references, etc. If there is nothing to declare, there is no need to add this section.

**References.** References will follow the guidelines indicated in the ICJME with the guidance of the National Library of Medicine (NLM), available on: [https://www.nlm.nih.gov/bsd/uniform\\_requirements.html](https://www.nlm.nih.gov/bsd/uniform_requirements.html).

Bibliographical references must be numbered consecutively according to the order of first appearance in the text, in superscript Arabic numerals, in the same font type and size as that used for the text. When they coincide with a punctuation mark, the reference will come before the mark. Journal titles must be abbreviated in accordance with the style used in Index Medicus; looking at the "List of Journals indexed" included every year in the January issue of Index Medicus. You can also consult the collective catalogue of periodic publications from the Spanish Health Sciences Libraries, or c17 (<http://www.c17.net/>). Should a journal not appear in either Index Medicus or the c17, its name must be written out in full.

The bibliography of the articles should be updated to the last 7 years and it is recommended to cite an appropriate number of references.

Some examples of bibliographical references are given below.

#### Journal article

To be written as:

Zurera-Delgado I, Caballero-Villarraso MT, Ruiz-García M. Análisis de los factores que determinan la adherencia terapéutica del paciente hipertenso. *Enferm Nefrol*. 2014;17(4):251-60.

In the case of more than six authors, name the first six authors, followed by the expression "*et al*":

Firaneck CA, Garza S, Gellens ME, Lattrel K, Mancini A, Robar A *et al*. Contrasting Perceptions of Home Dialysis Therapies Among In-Center and Home Dialysis Staff. *Nephrol Nurs J*. 2016;43(3):195-205.

In the event that it is a supplement:

Grupo Español Multidisciplinar del Acceso Vascular (GEMAV). Guía Clínica Española del Acceso Vascular para Hemodiálisis. *Enferm Nefrol*. 2018;21(Supl 1):S6-198.

Online journal article:

Pérez-Pérez MJ. Cuidadores informales en un área de salud rural: perfil, calidad de vida y necesidades. Biblioteca Lascasas [Internet]. 2012 [cited 10 Mar 2015];8:[about 59 p.]. Available from: <http://www.index-f.com/lascasas/documentos/lc0015.php>

Article published electronically ahead of the print version:

Blanco-Mavillard I. ¿Están incluidos los cuidados paliativos en la atención al enfermo renal? *Enferm Clin*. Available from: 2017; <http://dx.doi.org/10.1016/j.enfcli.2017.04.005>. Epub 2017 Jun 6.

#### Book chapter:

Pulido-Pulido JF, Crehuet-Rodríguez I, Méndez Briso-Montiano P. Punciones de accesos vasculares permanentes. En: Crespo-Montero R, Casas-Cuesta R, editores. *Procedimientos y protocolos con competencias específicas para Enfermería Nefrológica*. Madrid: Sociedad Española de Enfermería Nefrológica (SEDEN); 2013. p. 149-54.

#### Website

Sociedad Española de Enfermería Nefrológica. Madrid. [cited 5 Feb 2007]. Available at: <https://www.seden.org>.

Authors are advised to study the checklists on the website <http://www.equator-network.org/reporting-guidelines/> for guidance on the study design of their submission.

- ▶ CONSORT for clinical trials.
- ▶ TREND for non-randomised experimental studies.
- ▶ STROBE for observational studies.
- ▶ PRISMA for systematic reviews.
- ▶ COREQ for qualitative methodology studies.

**Tables and Figures.** All will be referred to within the text (without abbreviations or hyphens), and consecutively numbered with Arabic numerals, without superscript, according to the order mentioned within the text. They are to be presented at the end of the submission, on a separate page, with titles at the top.

Tables must be clear and simple, and any symbols or abbreviations must be accompanied by an explanatory note under the table. Images (photos or slides) must be of good quality. It is advisable to use the jpg. format.

## ETHIC RESPONSIBILITY ACCEPTANCE

Enfermería Nefrológica adheres to the ethical guidelines established below for publication and research.

**Authorship:** Authors making a submission do so on the understanding that it has been read and approved by all of its authors and that all agree to submitting it to the journal. ALL of the listed authors must have contributed to the conception and design and/or analysis and interpretation of the data and/or the writing of the submission and the author information must include the contribution of each on the first page.

Enfermería Nefrológica adheres to the definition and authorship established by The International Committee of Medical Journal Editors (ICMJE). In accordance with the criteria established by the ICMJE, authorship must be based on 1) substantial contributions to the conception and design, acquisition, analysis and interpretation of data, 2) drafting of article or critical review of its significant intellectual content and 3) final approval of the published version. All conditions must be fulfilled.

**Ethical approval:** When a submission requires the collection of research data that involves human subjects, it must be accompanied by an express statement in the materials and method section, identifying how informed consent was obtained and a declaration, wherever necessary, stating that the study has been approved by an appropriate research ethics committee. Editors reserve the right to decline the article when questions remain as to whether appropriate processes have been followed.

**Conflict of interests:** Authors must disclose any potential conflict of interest when they make a submission. These may include financial conflicts of interest, patent ownership, shareholdings, employment in dialysis/pharmaceutical companies, consultancies or conference payments by pharmaceutical companies relating to the research topic or area of study. Authors must remember that reviewers have to notify the editor of any conflict of interest that may influence the authors' opinions.

Any conflict of interest (or information specifying the absence of any conflict of interest) must be included on the first page under the title "Conflict of interests." This information will be included in the published article. The following sentence must be included when authors have no conflict of interest: "Author(s) declare(s) no conflict of interest."

**Sources of funding:** Authors must specify the source of financing for their research when they make a submission. Providers of the assistance must be named and their location included (city, state/province, country).

## PLAGIARISM DETECTION

Enfermería Nefrológica does not condone plagiarism and will not accept plagiarised material for publication under any circumstances.

Plagiarism includes, but is not limited to:

Directly copying text, ideas, images or data from other sources with the corresponding, clear and due acknowledgement.

Recycling text from the authors' own work without the corresponding referencing and approval by the editor (read more on recycling text in the policy on redundant publication, copying and recycling of text).

Using an idea from another source with modified language without the corresponding, clear and due acknowledgement.

The journal uses the **iThenticate-Similarity Check** service by Crossref to cross-match texts and detect plagiarism. All of the long articles submitted to Enfermería Nefrológica are processed by an anti-plagiarism system before being sent to peer review.

Enfermería Nefrológica follows the decision tree recommended by COPE in the event of suspecting a submission or an already-published article contains plagiarism (<http://publicationethics.org/files/Spanish%20%281%29.pdf>). Enfermería Nefrológica reserves the right to contact the institution to which the author(s) belong(s) in the event of confirming a case of plagiarism, both prior to and subsequent to publication.

Table 1. Summary table of the structure and length of each journal section.

Submission type	Summary (English and original article language)	Main text	Tables and figures	Authors	References
Editorial.	No.	Maximum length: 750 words, including references.	None.	Maximum recommended 2.	Maximum 4.
Long articles Quantitative Methodology.	250 words. Structure: introduction, objective, method, results and conclusions.	Maximum length: 3,500 words. Structure: introduction, objective, method, results, discussion and conclusions.	Maximum 6.	Maximum recommended 6.	Maximum 35.
Long articles Qualitative Methodology.	250 words. Structure: introduction, objective, method, results and conclusions.	Maximum length: 5,000 words. Structure: introduction, objective, method, results, discussion and conclusions.	Maximum 6.	Maximum recommended 6.	Maximum 35.
Brief articles.	250 words. Structure: introduction, objective, method, results and conclusions.	Maximum length: 2,500 words. Structure: introduction, objective, method, results, discussion and conclusions.	Maximum 3.	Maximum recommended 6.	Maximum 15.
Reviews.	250 words. Structure: introduction, objective, methodology, results and conclusions.	Maximum length: 3,800 words. structure: introduction, objective, methodology, results, discussion and conclusions.	Maximum 6.	Maximum recommended 6.	Maximum 80.
Clinical case.	250 words. Structure: case description, care plan description, plan evaluation, conclusions.	Maximum length: 2,500 words. Structure: introduction; presentation of case; (complete) nursing evaluation indicating model; description of care plan (containing the possible nursing diagnoses and problems regarding collaboration, objective and nursing interventions), care plan evaluation and conclusions.	Maximum 3.	Maximum recommended 3.	Maximum 15.

## NORMAS DE PUBLICACIÓN

La revista *Enfermería Nefrológica* es la publicación oficial de la Sociedad Española de Enfermería Nefrológica (SEDEN). Aunque el idioma preferente de la revista es el español, se admitirá también artículos en portugués e inglés.

*Enfermería Nefrológica* publica regularmente cuatro números al año, el día 30 del último mes de cada trimestre y dispone de una versión reducida en papel. Todos los contenidos íntegros están disponibles en la web de acceso libre y gratuito: [www.enfermerianefrolologica.com](http://www.enfermerianefrolologica.com). La revista es financiada por la entidad que la publica y se distribuye bajo una licencia Creative Commons Atribución No Comercial 4.0 Internacional (CC BY-NC 4.0). Esta revista no aplica ningún cargo por publicación.

La revista está incluida en: CINAHL, IBECS, SciELO, CUIDEN, SIIC, Latindex, Capes, DULCINEA, Dialnet, DOAJ, ENFISPO, Scopus, Sherpa Romeo, C17, RECOLECTA, Redalyc, REBIUN, REDIB, MIAR, WordCat, Google Scholar Metric, Cuidatge, Cabells Scholarly Analytics, AURA, JournalTOCs y Proquest.

*Enfermería Nefrológica* publica artículos de investigación enfermera relacionados con la nefrología, hipertensión arterial, diálisis y trasplante, que tengan como objetivo contribuir a la difusión del conocimiento científico que redunde en el mejor cuidado del enfermo renal. Asimismo, se aceptarán artículos de otras áreas de conocimiento enfermero o de materias transversales que redunden en la mejora del conocimiento profesional de la enfermería nefrológica.

Para la publicación de los manuscritos, *Enfermería Nefrológica* sigue las directrices generales descritas en los requisitos de uniformidad para manuscritos presentados para publicación en revistas biomédicas, elaboradas por el comité internacional de editores de revistas biomédicas (ICJME). Disponible en <http://www.icmje.org>. En la valoración de los manuscritos recibidos, el comité editorial tendrá en cuenta el cumplimiento del siguiente protocolo de redacción.

### SECCIONES DE LA REVISTA

La revista consta fundamentalmente de las siguientes secciones:

**Editorial.** Artículo breve en el que se expresa una opinión o se interpretan hechos u otras opiniones. Revisiones breves por encargo del comité editorial.

**Originales.** Son artículos en los que el autor o autores estudian un problema de salud, del que se deriva una actuación específica de enfermería realizada con metodología cuantitativa, cualitativa o ambas.

Los originales con metodología cuantitativa y cualitativa deberán contener: resumen estructurado (máximo de 250 palabras en inglés y en el idioma original), introducción, objetivos, material y método, resultados, discusión y conclusiones (extensión máxima de 3.500 palabras para los de metodología cuantitativa y 5.000 palabras para los de metodología cualitativa, máximo 6 tablas y/o figuras, máximo 35 referencias bibliográficas).

**Revisiones.** Estudios bibliométricos, revisiones narrativas, integrativas, sistemáticas, metaanálisis y metátesis sobre temas relevantes y de actualidad en enfermería o nefrología, siguiendo la misma estructura y normas

que los trabajos originales cualitativos, pero con un máximo de 80 referencias bibliográficas.

**Casos clínicos.** Trabajo fundamentalmente descriptivo de uno o unos pocos casos relacionados con la práctica clínica de las enfermeras, en cualquiera de sus diferentes ámbitos de actuación. La extensión debe ser breve y se describirá la metodología de actuación encaminada a su resolución bajo el punto de vista de la atención de enfermería. Incluirá un resumen de 250 palabras en castellano e inglés estructurado en: descripción caso/os, descripción del plan de cuidados, evaluación del plan, conclusiones. La extensión máxima será de 2.500 palabras, con la siguiente estructura: introducción; presentación del caso; valoración enfermera completa indicando modelo; descripción del plan de cuidados (conteniendo los posibles diagnósticos enfermeros y los problemas de colaboración, objetivos e intervenciones enfermeras. Se aconseja utilizar taxonomía NANDA-NIC-NOC); evaluación del plan de cuidados y conclusiones. Se admitirá un máximo de 3 tablas/figuras y de 15 referencias bibliográficas.

**Cartas al Editor Jefe.** Consiste en una comunicación breve en la que se expresa acuerdo o desacuerdo con respecto a artículos publicados anteriormente. También puede constar de observaciones o experiencias sobre un tema de actualidad, de interés para la enfermería nefrológica. Tendrá una extensión máxima de 1.500 palabras, 5 referencias bibliográficas y una figura/tabla.

**Original breve.** Trabajos de investigación de las mismas características que los originales, pero de menor envergadura (series de casos, investigaciones sobre experiencias con objetivos y resultados muy concretos), que pueden comunicarse de forma más abreviada. Seguirán la siguiente estructura: resumen estructurado (250 palabras en inglés y castellano), introducción, objetivos, material y método, resultados, discusión y conclusiones (extensión 2.500 palabras, máximo 3 tablas y/o figuras, máximo 15 referencias bibliográficas).

**Otras secciones.** En ellas se incluirán artículos diversos que puedan ser de interés en el campo de la enfermería nefrológica.

Las extensiones indicadas son orientativas. La extensión de los manuscritos excluye: título, autores/filiación, resumen, tablas y referencias bibliográficas. La estructura y extensión de cada sección de la revista se resume en la **tabla 1**.

### ASPECTOS FORMALES PARA LA PRESENTACIÓN DE LOS MANUSCRITOS

Los autores ceden de forma no exclusiva los derechos de explotación de los trabajos publicados y consiente en que su uso y distribución se realice con la licencia **creative commons atribución - no comercial** 4.0 internacional (CC BY-NC 4.0). Puede consultar desde aquí la versión informativa y el **texto legal** de la licencia. Esta circunstancia ha de hacerse constar expresamente de esta forma cuando sea necesario.

No se aceptarán manuscritos previamente publicados o que hayan sido enviados al mismo tiempo a otra revista. En el caso de que hubiera sido presentado a alguna actividad científica (Congreso, Jornadas) los autores lo pondrán en conocimiento del comité editorial. Sería recomendable que todos los trabajos hayan pasado un comité de ética.



Los manuscritos se remitirán por la plataforma digital de la revista que se encuentra en su página web, a la que se accede en la siguiente dirección: <http://www.enfermerianefrologica.com>. (Apartado "Enviar un artículo").

Como parte del proceso de envío, los autores/as están obligados a comprobar que su envío cumpla todos los elementos que se muestran a continuación. Se devolverán a los autores/as aquellos envíos que no cumplan estas directrices.

Junto al manuscrito deberá remitirse una carta de presentación al editor jefe de la revista, en la que se solicita la aceptación para su publicación en alguna de las secciones de la misma. En ella se incorporará el formulario de acuerdo de publicación, originalidad del trabajo, responsabilidad de contenido y no publicación en otro medio.

La presentación de los manuscritos se hará en dos archivos en formato word, uno identificado y otro anónimo para su revisión por pares. El tamaño de las páginas será DIN-A4, a doble espacio y un tamaño de letra de 12, dejando los márgenes laterales, superior e inferior de 2,5 cm. Las hojas irán numeradas correlativamente. Se recomienda no utilizar encabezados, pies de página, ni subrayados, que dificultan la maquetación en el caso de que los manuscritos sean publicados.

La herramienta de gestión de la revista Enfermería Nefrológica acusará recibo de todos los manuscritos. Una vez acusado recibo, se inicia el proceso editorial, que puede ser seguido por los autores en la plataforma mencionada anteriormente.

Los manuscritos se separarán en tres archivos, que se incluirán en la plataforma OJS de la revista:

#### Archivo 1:

- ▮ Carta de presentación del manuscrito.
- ▮ Formulario de acuerdo de publicación, responsabilidad de contenido y no publicación en otro medio.

#### Archivo 2:

- ▮ Trabajo identificado completo (incluidas tablas y anexos).

#### Archivo 3:

- ▮ Trabajo anónimo completo (incluidas tablas y anexos).

Antes del envío definitivo habrá que aceptar el apartado de responsabilidad ética.

Los manuscritos originales deberán respetar las siguientes condiciones de presentación:

**Primera página.** Se inicia con el título del artículo, nombre y apellidos completos de los autores, centros de trabajos, país de origen, correo electrónico y Orcid (identificador único de investigadores). Se indicará a qué autor debe ser enviada la correspondencia, así como si los apellidos de los autores irán unidos por un guión o sólo utilizarán un solo apellido.

**Resumen.** Todos los artículos deberán incluir un resumen (en el idioma de origen y en inglés). La **extensión máxima** será de **250 palabras**. El resumen ha de tener la información suficiente para que el lector se haga una idea clara del contenido del manuscrito, sin ninguna referencia al texto, citas bibliográficas ni abreviaturas y estará estructurado con los mismos apartados del trabajo (Introducción, Objetivos, Metodología, Resultados y Conclusiones). El resumen no contendrá información que no se encuentre en el texto.

**Palabras clave.** Al final del resumen deben incluirse 3-6 palabras clave, que estarán directamente relacionadas con las principales variables del estudio (se aconseja utilizar lenguaje controlado DeCS <https://decs.bvsalud.org/es/> y MeSH <https://www.ncbi.nlm.nih.gov/mesh>).

**Texto.** En los manuscritos de observación y experimentales, el texto suele dividirse en apartados o secciones denominadas: **Introducción**, que debe proporcionar los elementos necesarios para la comprensión del trabajo e incluir los objetivos del mismo. **Material y Método**, empleado en la investigación, que incluye el centro donde se ha realizado, el tiempo que ha durado, características de la serie, sistema de selección de la muestra, las técnicas utilizadas y los métodos estadísticos. **Resultados**, que deben ser una exposición de datos, no un comentario o discusión sobre alguno de ellos. Los resultados deben responder exactamente a los objetivos planteados en la introducción. Se pueden utilizar tablas y/o figuras para complementar la información, aunque deben evitarse repeticiones innecesarias de los resultados que ya figuren en las tablas y limitarse a resaltar los datos más relevantes. En la **Discusión** los autores comentan y analizan los resultados, relacionándolos con los obtenidos en otros estudios, con las correspondientes citas bibliográficas, así como las conclusiones a las que han llegado con su trabajo. La **Discusión** y las **Conclusiones** se deben derivar directamente de los resultados, evitando hacer afirmaciones que no estén refrendados por los resultados obtenidos en el estudio.

**Agradecimientos.** Cuando se considere necesario se expresa el agradecimiento de los autores a las diversas personas o instituciones que hayan contribuido al desarrollo del trabajo. Tendrán que aparecer en el mismo aquellas personas que no reúnen todos los requisitos de autoría, pero que han facilitado la realización del manuscrito, como por ejemplo las personas que hayan colaborado en la recogida de datos.

**Declaración de uso de Inteligencia Artificial (IA) generativa en la redacción científica.** La IA y las tecnologías asistidas por IA no deben figurar como autor o coautor, ni citarse como autor. La autoría implica responsabilidades y tareas que solo pueden ser atribuidas y realizadas por humanos. Si se ha utilizado la misma, los autores deben incluir un apartado antes de la bibliografía, informando sobre el uso de la IA: "Durante la preparación de este trabajo, los autores utilizaron [NOMBRE HERRAMIENTA / SERVICIO] para [MOTIVO]. Después de utilizar esta herramienta/servicio, los autores revisaron y editaron el contenido según sea necesario y asumen total responsabilidad por el contenido de la publicación". Esta declaración no se aplica al uso de herramientas básicas para verificar la gramática, la ortografía, las referencias bibliográficas, etc. Si no hay nada que declarar, no es necesario agregar este apartado.

**Bibliografía.** Se elaborará de acuerdo a lo que indica el ICJME con las normas de la National Library of Medicine (NLM), disponible en: [https://www.nlm.nih.gov/bsd/uniform\\_requirements.html](https://www.nlm.nih.gov/bsd/uniform_requirements.html).

Las referencias bibliográficas deberán ir numeradas correlativamente según el orden de aparición en el texto por primera vez, en números arábigos en superíndice, con el mismo tipo y tamaño de letra que la fuente utilizada para el texto. Cuando coincidan con un signo de puntuación, la cita precederá a dicho signo. Los nombres de las revistas deberán abreviarse de acuerdo con el estilo usado en el Index Medicus; consultando la "List of Journals indexed" que se incluye todos los años en el número de enero del Index Medicus. Así mismo, se puede consultar el catálogo colectivo de publicaciones periódicas de las bibliotecas de ciencias de la salud españolas, denominado c17 (<http://www.c17.net/>). En caso de que una revista no esté incluida en el Index Medicus ni en el c17, se tendrá que escribir el nombre completo.

La Bibliografía de los artículos debe estar actualizada a los últimos 7 años y se recomienda citar un número apropiado de referencias

A continuación se dan algunos ejemplos de referencias bibliográficas.

#### Artículo de revista

Se indicará:

Zurera-Delgado I, Caballero-Villarraso MT, Ruíz-García M. Análisis de los factores que determinan la adherencia terapéutica del paciente hipertenso. *Enferm Nefrol*. 2014;17(4):251-60.

En caso de más de 6 autores, mencionar los seis primeros autores, seguidos de la expresión «et al»:

Firaneck CA, Garza S, Gellens ME, Lattrel K, Mancini A, Robar A *et al.* Contrasting Perceptions of Home Dialysis Therapies Among In-Center and Home Dialysis Staff. *Nephrol Nurs J.* 2016;43(3):195-205.

En caso de ser un Suplemento:

Grupo Español Multidisciplinar del Acceso Vascular (GEMAV). Guía Clínica Española del Acceso Vascular para Hemodiálisis. *Enferm Nefrol.* 2018;21(Supl 1):S6-198.

Artículo de revista de Internet:

Pérez-Pérez MJ. Cuidadores informales en un área de salud rural: perfil, calidad de vida y necesidades. Biblioteca Lascasas [Internet]. 2012 [consultado 10 Mar 2015];8:[aprox. 59 p.]. Disponible en: <http://www.index-f.com/lascasas/documentos/lc0015.php>

Artículo publicado en formato electrónico antes que en versión impresa:

Blanco-Mavillard I. ¿Están incluidos los cuidados paliativos en la atención al enfermo renal? *Enferm Clin.* 2017; Disponible en: <http://dx.doi.org/10.1016/j.enfcli.2017.04.005>. Epub 6 Jun 2017.

### Capítulo de un libro:

Pulido-Pulido JF, Crehuet-Rodríguez I, Méndez Briso-Montiano P. Punciones de accesos vasculares permanentes. En: Crespo-Montero R, Casas-Cuesta R, editores. *Procedimientos y protocolos con competencias específicas para Enfermería Nefrológica*. Madrid: Sociedad Española de Enfermería Nefrológica (SEDEN); 2013. p. 149-54.

### Página Web

Sociedad Española de Enfermería Nefrológica. Madrid. [consultado 5 Feb 2007]. Disponible en: <https://www.seden.org>.

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Tipo de manuscrito	Resumen (Inglés e idioma original del artículo)	Texto principal	Tablas y figuras	Autores	Referencias
Editorial.	No	Extensión máxima: 750 palabras, incluida bibliografía.	Ninguna.	Máximo recomendado 2.	Máximo 4.
Originales Metodología Cuantitativa.	250 palabras. Estructura: introducción, objetivos, material y método, resultados y conclusiones.	Extensión máxima: 3500 palabras. Estructura: introducción, objetivos, material y método, resultados, discusión y conclusiones.	Máximo 6.	Máximo recomendado 6.	Máximo 35.
Originales Metodología Cualitativa.	250 palabras. Estructura: introducción, objetivos, material y método, resultados y conclusiones.	Extensión máxima: 5000 palabras. Estructura: introducción, objetivos, material y método, resultados, discusión y conclusiones.	Máximo 6.	Máximo recomendado 6.	Máximo 35.
Originales Breves.	250 palabras. Estructura: introducción, objetivos, material y método, resultados y conclusiones.	Extensión máxima: 2500 palabras. Estructura: introducción, objetivos, material y método, resultados, discusión y conclusiones.	Máximo 3.	Máximo recomendado 6.	Máximo 15.
Revisiones.	250 palabras. Estructura: introducción, objetivos, metodología, resultados y conclusiones.	Extensión máxima: 3800 palabras. Estructura: introducción, objetivos, material y método, resultados, discusión y conclusiones.	Máximo 6.	Máximo recomendado 6.	Máximo 80.
Casos Clínicos.	250 palabras. Estructura: descripción caso, descripción del plan de cuidados, evaluación del plan, conclusiones.	Extensión máxima: 2500 palabras. Estructura: introducción; presentación del caso; valoración enfermera (completa); descripción del plan de cuidados (conteniendo los posibles diagnósticos enfermeros y los problemas de colaboración, objetivos e intervenciones enfermeras); evaluación del plan de cuidados y conclusiones.	Máximo 3.	Máximo recomendado 3.	Máximo 15.





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