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Riots in New Caledonia: Impact of constrained management on peritoneal dialysis patients

(Emeutes en Nouvelle-Calédonie : une prise en charge contrainte et ses impacts pour des patients en dialyse péritonéale)

Noémie Baroux[1,3] Laura Maire[2], Laure Cadic[3], Anne-Françoise Lemaitre[3], Pauline Borceux[3], Brigitte Glasman[3]

[1]Réseau de l'insuffisance rénale en Nouvelle-Calédonie
[2]Unité de néphrologie de Nouvelle-Calédonie
[3]Association pour le Traitement et la Prévention de l'Insuffisance Rénale (ATIR), Nouvelle-Calédonie

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Abstract

New Caledonia is a French collectivity—a group of islands and archipelagos—in the South Pacific region. The riots in New Caledonia that began on the evening of May 13, 2024, caused sudden, unannounced disruption to many areas of public life. They led to the healthcare system's total disorganization, disrupting the care provided to home peritoneal dialysis patients. This article describes the experience of the peritoneal dialysis team at the Association pour le traitement et la prévention de l'insuffisance rénale en Nouvelle-Calédonie (ATIR) in caring for home peritoneal dialysis patients during the first seven weeks of the riots.

These difficulties have led to changes in dialysis management (reuse of single-use devices, non-use of home care self-employed nurses, and reduction in dialysis volume and/or frequency). Our study concerns 35 nonhospitalized peritoneal dialysis patients as of May 12, 2024. The adjustments in management required the care team to be vigilant by getting updates concerning the patients via phone calls. No serious events occurred during the seven-week study period.

Based on this research, the main aspects that are essential to good responsiveness were as follows: 1) a team medical referent with good knowledge of patients and geography, 2) a coordinated team of peritoneal dialysis caregivers accustomed to working together, 3) shared tools accessible online for teleworking people involved in the care of peritoneal dialysis patients, and 4) harmonized training on the usual care pathway for patients and home independent nurses.

Keywords: New Caledonia, riots, peritoneal dialysis, peritonitis, death, hospitalization

Résumé

La Nouvelle-Calédonie est une collectivité française située dans la région du Pacifique Sud composée d'un ensemble d'îles et d'archipels. Les émeutes ont débuté en Nouvelle-Calédonie dans la soirée du 13 mai 2024 et provoqué une interruption soudaine et sans préavis de nombreux secteurs de la vie publique. Elles ont entraîné une désorganisation totale du système de santé et perturbé les soins des patients en dialyse péritonéale à domicile. Nous décrivons dans cet article l'expérience de l'équipe de dialyse péritonéale de l'Association pour le Traitement et la Prévention de l'Insuffisance Rénale en Nouvelle-Calédonie (Atir) pour la prise en charge de patients en dialyse péritonéale à domicile durant les 7 premières semaines des émeutes.

Ces difficultés ont entraîné des modifications de prise en charge en dialyse (réutilisation de dispositifs à usage unique, non passage chez le patient de l'infirmier(e) libéral(e) à domicile ainsi que des baisses de volumes et/ou fréquence de dialyse). Notre étude concerne 35 patients en dialyse péritonéale, et non hospitalisés, au 12 mai 2024. Ces ajustements de prise en charge, ont sollicité toute la vigilance téléphonique de l'équipe soignante auprès des patients concernés. Elles n'ont pas entraîné de survenue d'événement grave sur les 7 semaines étudiées.
Suite à cette expérience, les aspects principaux indispensables à une bonne réactivité dans ce contexte ont été : 1) Un référent médical d'équipe ayant une bonne connaissance des patients et de la géographie; 2) Une équipe de soignants en dialyse péritonéale coordonnée habituée à travailler ensemble; 3) Des outils partagés et accessibles en ligne avec la possibilité d'être déployés en télétravail pour l'ensemble des acteurs intervenant dans la prise en charge des patients de dialyse péritonéale; 4) Les formations harmonisées des patients et des infirmier(e)s libéraux dans le parcours de soin habituel.

Mots-clés : Nouvelle-Calédonie, émeute, dialyse péritonéale, péritonite, décès, hospitalisation

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Introduction

New Caledonia is a French collectivity comprising a group of Melanesian islands and archipelagos in the South Pacific region. Grande Terre, 400 km long and 64 km wide, is the main island whose main town is Nouméa. Greater Nouméa (with the neighboring communes of Païta, Dumbéa, and Mont-Dore) has a population of 182,341, or two-thirds of the archipelago's 271,407 inhabitants.

The prevalence rate of treated end-stage renal disease (ESRD) in New Caledonia is 3,000 per million inhabitants, twice as high as in metropolitan France [1,2]. On December 31, 2023, 690 patients with ESRD underwent dialysis, with 8% of them on peritoneal dialysis (PD).

The 2024 riots in New Caledonia, which began on May 13, severely damaged Greater Nouméa's road infrastructure, shops, and buildings. The resulting roadblocks have made it difficult or impossible to travel around the communes. As a result, access to healthcare facilities, patients' homes, medical equipment, and medicines for proper treatment has been limited, putting patients at risk. Patients suffering from kidney failure and receiving renal replacement therapy are particularly vulnerable to the adverse consequences of these events, as their survival depends on a functional infrastructure, advanced technology, and the availability of specific drugs and well-trained medical staff.

When healthcare resources are both scarce and precarious, ethically justified principles of action are needed to continue treating patients. A few articles are available on the management of dialysis patients in the context of a sudden disruption to healthcare access, most often in the wake of war or a natural disaster, such as an earthquake [3–8].

The riots in New Caledonia highlighted the importance of preparing for conflict-related disasters or natural catastrophes that make travel difficult or impossible, particularly among vulnerable populations, such as chronic home dialysis patients, whose specific challenges remain insufficiently described and understood.

This article describes the experience of the PD team at the Association pour le traitement et la prévention de l'insuffisance rénale en Nouvelle-Calédonie (Atir) in caring for home PD patients in the first seven weeks of the New Caledonian riots.

Patient and method

Population and study period

The patients included in our study were prevalent PD patients not hospitalized on May 12, 2024, and usually managed by the PD team at Atir. Patients are distributed throughout the territory (*Figure 1*).

The study period ran from May 13 to June 28, 2024. On the evening of May 13, issues with accessing and traveling to care facilities marked the start of the crisis and the initiation of care reorganization by the home dialysis care team. As of June 28, all patients under Atir's care on PD treatment had been medically assessed through physical consultations or, failing that, teleconsultations supported by biological check-up results.

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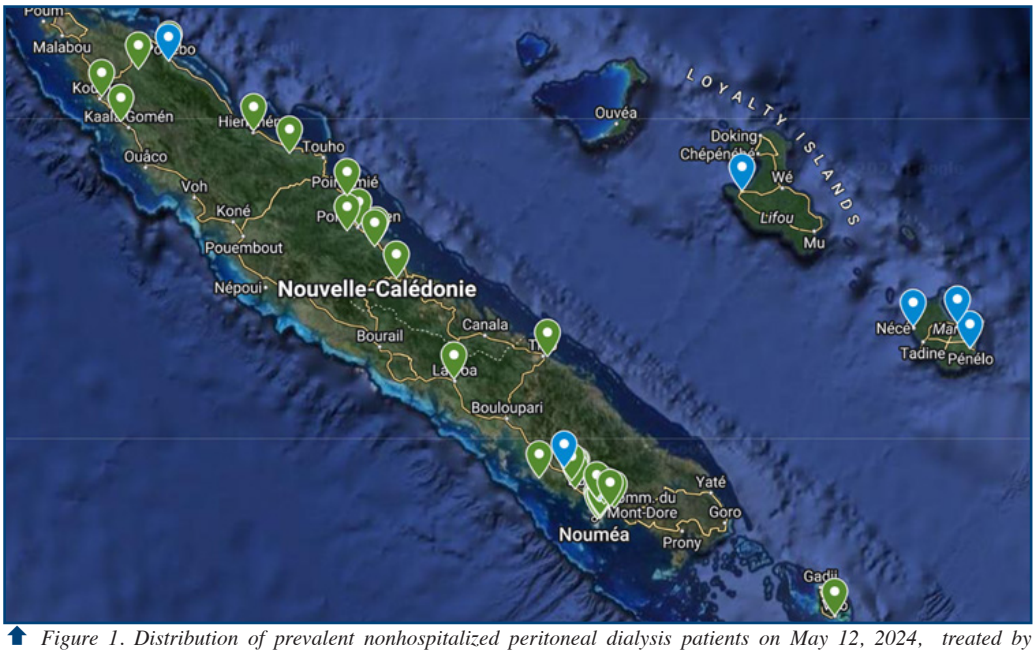

Figure 1. Distribution of prevalent nonhospitalized peritoneal dialysis patients on May 12, 2024, treated by Association pour le traitement de l'insuffisance rénale, New Caledonia

Nephrology care organization in New Caledonia

Nephrology care in New Caledonia is based on three structures: the Atir, the Unité de néphrologie de Nouvelle-Calédonie (U2nc), and the nephrology department of the Centre Hospitalier Territorial Gaston-Bourret (CHT). The Atir comprises a home dialysis unit based in Greater Nouméa, eight assisted self-dialysis units (known in New Caledonia as "unité d'hémodialyse de proximité") throughout the territory, and a medicalized dialysis unit in Greater Nouméa. The u2nc has a home dialysis team located in Greater Nouméa, a dialysis center and mixed assisted self-dialysis/medicalized dialysis unit in Greater Nouméa, and two mixed units outside Greater Nouméa. The CHT is the only hospital in New Caledonia with a nephrology department. It is located in Greater Nouméa.

Usually, home PD patients benefit from a storage period of around one week, depending on the storage space available in the home, for patients in Greater Nouméa and around one month for patients outside Greater Nouméa.

Riots and their consequences

The riots that broke out in New Caledonia on the evening of May 13 caused sudden, unannounced disruption to many areas of public life, affecting the healthcare system and the provision of care to PD patients at their homes. From May 13 to June 10, traffic conditions were severely disrupted. Care facilities and patients' homes were inaccessible, leading to a chain reaction with a direct impact on the care of PD patients. The offices of the PD care team were ransacked and access was impossible. (*Figure 2 et 3*).

After June 10, security and traffic conditions gradually improved, allowing the reestablishment of certain patient management tools, such as a few physical consultations, blood tests, and easy access to PD consumables. By June 28, all patients in Greater Nouméa had undergone consultations or teleconsultations.

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The riots' main consequences for patients and care teams were as follows:

- Access to the internal-use pharmacy (PUI), dialysis facilities, and CHT—restricted or impossible until June 10 and then severely disrupted until June 28;
- Delivery of PD consumables to patients' homes—restricted or impossible until June 10 and severely disrupted until June 28;
- For Self-employed Registered Nurses (IDEL) in Greater Nouméa, access to patients' homes—restricted or impossible until June 10 and severely disrupted until June 28;
- Tight supplies for pharmacies throughout the country over the entire period;
- Tight supplies of PD consumables throughout the territory over the entire period;
- Difficulties in accessing food supplies in Greater Nouméa over the entire period;

Définitions and statistical analysis

The body mass index (BMI) ranges used are recognized by the World Health Organization (WHO): BMI < 18.5 (lean), 18.5 ≤ BMI < 25 (normal), 25 ≤ BMI < 30 (overweight), and 30 ≤ BMI < 35 (obese).

According to the International Society of Peritoneal Dialysis (ISPD) guidelines [9], peritonitis is diagnosed when at least two of the following criteria are observed: 1) consistent clinical features (cloudy effluent,

Figure 2. Office of the peritoneal dialysis team following the riots of May 13, 2024, Association pour le traitement de l'insuffisance rénale, New Caledonia

Figure 3. Peritoneal dialysis treatment room following the riots of May 13, 2024, Association pour le traitement de l'insuffisance rénale, New Caledonia.**
*This photo of our treatment room, taken too quickly, could not be reproduced for security reasons. We preferred to keep it this way to show our readers the destruction of our work tools

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abdominal pain, etc.); 2) effluent leukocyte count > 100/μl (after stasis of at least 2 hours), including more than 50% neutrophils; and 3) a positive dialysis effluent culture.

This study considered hospitalizations started between May 13 and June 28, as well as death and peritonitis events that occurred between May 13 and June 28.

When describing adapted PD prescriptions, we used the following definitions:
- Prescription of PD with degraded volumetry only if the total volume per week was lower than the patient's usual prescription.
- Prescription of PD with reduced frequency only if the number of sessions per week was reduced compared to the patient's usual prescription.
- Prescription of PD with reduced volume and frequency if the total volume and number of sessions per week were reduced compared to the patient's usual prescription.

Categorical and continuous variables were expressed in numbers (percentages) with the mean values (± standard deviation). For percentage comparisons, Fisher's exact test was used. A p-value < 0.05 is considered significant. Missing data, if any, are described and not taken into account in the analyses. All analyses were performed using R software, version 4.2.2.

Results

Description of the population

Our study involved 35 patients on PD and not hospitalized on May 12, 2024. The mean age was 66 years (±13), and 57% of the patients were men (*Table I*).

Of these, around half lived in Greater Nouméa (51%). Twenty-six patients (75%) were on automated peritoneal dialysis (APD) or optimized continuous peritoneal dialysis (OCPD).

Table I. Description of prevalent patients undergoing home peritoneal dialysis as of May 12, 2024, Association for the Prevention and Treatment of Renal Failure, New Caledonia.

Description of patients	
PD ATIR patients - N	35
Age - Avg (+/- SD)	66 (13)
Men - n/N (%)	20/35 (57%)
Place of residence - n/N (%)	
Nouméa/Grand Nouméa	18/35 (51%)
Outside Greater Nouméa	17/35 (49%)
Body mass index - n/N (%)	
≤ 18,5	2/35 (6%)
18.5 - 30	13/35 (37%)
≥ 30	20/35 (57%)
Peritoneal dialysis management	
Time since PD in months - Avg (+/- SD)	57 (54)
Dialysis technique - n/N (%)	
APD	24/35 (69)
CAPD	9/35 (26)
OCPD	2/35 (6)
Erythropoietin in progress - n/N (%)	27/35 (77)
Comorbidities	
Diabetes - n/N (%)	23/35 (66)
on insulin - /n/N (%)	8/25 (32)
Coronary insufficiency - n/N (%)	7/35 (20)

ATIR: Association pour la Prévention et le Traitement de l'Insuffisance Rénale (Association for the prevention and treatment of renal failure); Avg: mean; SD: standard deviation; PD: peritoneal dialysis; APD: automated peritoneal dialysis; OCPD: optimized continuous peritoneal dialysis; CAPD: continuous ambulatory peritoneal dialysis

Adapting patient management and the occurrence of eventss

- *Response to home care nurses' non-access to patients' homes*

Due to the unsafe roads and the total inaccessibility of several districts of Greater Nouméa, patients were deprived of home care by an IDEL trained in the PD technique.

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Telephone assistance had to be quickly set up to ensure continuity of care. When patients could follow telephone instructions, they or their relatives were guided daily or several times a day to perform both APD and CAPD care. The description of the equipment, the various steps involved in performing the techniques, and the rules of asepsis represented a major challenge in this situation. The increased risk of peritonitis and the impossibility of accessing care facilities, such as the ATIR or the CHT, necessitated reinforced support. Thanks to their knowledge of the PD technique, the IDELs were also able to refer this organization to patients.

As of May 12, 2024, 13 patients (37%) usually had a homecare provider for PD management (*Table II*); for six patients (46%), the providers were unable to access their homes. For these six patients, the PD care team had to train their family and friends in the dialysis technique through daily telephone support. These six patients all lived in Greater Nouméa. The average age was 73 (±10), and 50% were men (*Table III*).

The mean time since the initiation of PD was 43 months (±49). No peritonitis, hospitalization, or death occurred, whereas two cases of peritonitis occurred for patients whose IDEL stayed at home.

•*Responding to difficulties in delivering PD consumables to patients' homes and the occurrence of events*

⬇ *Table II. Management of prevalent home peritoneal dialysis patients from May 13, 2024, Association pour la Prévention et le Traitement de l'Insuffisance Rénale, New Caledonia*

	n/N (%)
A private nurse usually visits the home	
Patients with a private home care nurse before the riots	13/35 (37)
Have retained their home care self employed nurse	7/13 (54)
Have not retained their home care self employed nurse	6/13 (46)
Adjustment of peritoneal dialysis prescription	
Patients without riot-related prescription changes	21/35 (60)
Patients with riot-related prescription changes	14/35 (40)
With degraded volumetry only	6/14 (43)
With degraded frequency only	5/14 (36)
With degraded volumetry and frequency	3/14 (21)
Reuse of single-use dialysis lines according to a procedure	
Patients concerned by the possibility of line reuse (APD and OCPD patients)	26/35 (74)
Patients who have reused single-use lines	4/26 (15)
Patients who have not reused single-use lines	24/26 (85)

APD: automated peritoneal dialysis; OCPD: optimized continuous peritoneal dialysis

Difficulties in delivering PD medical equipment were experienced due to the lack of access to patients' homes, as well as severely compromised access to Atir's usual equipment storage area. Care teams had to adjust dialysis prescriptions to reduce the amount of equipment used.

These prescription adaptations first concerned patients living in inaccessible areas of Greater Nouméa. For these patients, stock is usually held for a week, but there was no visibility on home delivery times. In cases of low residual renal function (RRF), the use of hypertonic bags was

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adapted to ensure adequate blood volume, and patients were asked to apply water restriction measures in this context.

⬇ *Table III. Description of prevalent home peritoneal dialysis patients and events according to degraded management implemented after May 13 up to June 28, 2024, Association pour la Prévention et le Traitement de l'Insuffisance Rénale, New Caledonia*

	Degraded care				No deterioration in care
	Reuse of single-use devices	Home visits by a home care self employed nurse not maintained	Prescription of PD degraded	Total	
Number of patients	4	6	14	15	20
Place of residence in Noumea or Greater Nouméa - n (%)	4 (100)	6 (100)	13 (93)	14 (93)	4 (20)
Age - Avg (+/- SD)	71 (13)	73 (10)	66 (12)	65 (14)	63 (14)
Men - n (%)	2 (50)	3 (50)	9 (64)	9 (60)	11 (55)
Time since PD in months - Avg (+/- SD)	22 (16)	43 (49)	51 (49)	50 (48)	62 (59)
Events during study period					
Hospitalization - n (%)	0 (0)	0 (0)	0 (0)	0 (0)	1 (5)
Peritonitis - n (%)	0 (0)	0 (0)	1 (7)	1 (7)	3 (15)
Deaths - n (%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Avg: mean; PD: peritoneal dialysis; SD: standard deviation

A temporary storage area was also set up in the personal garage of one of the PD team's healthcare professionals.

In response to the tight supply of PD equipment at home, the care team degraded patient management, either by adjusting the dialysis prescription or by asking patients to reuse equipment that is usually single-use only. For 14 patients (40%), the prescription was adjusted by decreasing the volume of dialysis per week and/or the frequency of sessions per week: six patients (43%) with a degraded PD volumetry alone, five patients (36%) with a degraded PD frequency alone, and three patients (21%) with a degraded volumetry and frequency (*Table II*). Of these, only one patient developed peritonitis. No hospitalizations or deaths occurred during the study period (*Table III*).

The reuse of single-use devices was considered for 26 patients on APD or DPCO. Of these, four were instructed by the nursing team to reuse single-use Homechoice Claria™ cycler devices with cassettes. For all four patients, no peritonitis, hospitalization, or death occurred during the study period. Of all these patients who had undergone degraded management (adjusted prescription and/or reuse of single-use devices), 93% lived in Greater Nouméa, compared with 20% of patients who had not undergone degraded management (p-value < 0.0001).

Discussion

The riots that broke out in New Caledonia led to a sudden deterioration of the population's circulation and tensions in the supply of food and medical equipment, particularly in Greater

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Nouméa. These issues caused adjustments in dialysis management (reuse of single-use devices, no home visits by the IDEL, and reduced dialysis volume and/or frequency of dialysis sessions per week). This article shows that these adjustments, accompanied by the care team's telephone calls to patients, did not lead to any unusual increase in the occurrence of serious events over the seven-week study period. The results of our study also highlight the resilience and adaptability of the care teams and PD patients at home during a sudden disruption of access to care and medical equipment.

We have not identified any articles describing the experience of managing PD patients in the context of riots. However, several articles report the results of studies of PD patients during earthquakes [4,6,10,11], with a brutal constraint on the access to the patients' homes, which may be similar to what was experienced in New Caledonia. These studies underline the increased risk of infection, particularly of peritonitis, for PD patients due to deteriorated sanitary conditions, as shown by a study during the Chilean earthquake, which showed an increase in fungal peritonitis [10].

There have also been reports of PD patients being cared for during a war [5,7]. We confirm that population conflicts jeopardize the care of PD patients due to difficulties in traveling to their homes and accessing care structures and the shortages of vital medical equipment [8]. A couple of studies [3,8] pointed out that during conflicts, patients undergoing PD treatment may not be able to obtain sufficient supplies of dialysis equipment, which can lead to underdialysis and thus cause electrolyte disorders, the onset or worsening of anemia, uncontrolled hypertension, hypervolemia, or digestive disorders with undernutrition. These studies also reported that PD patients appear to have a lower risk for serious events than hemodialysis patients. They also pointed out that patients put on PD during conflicts need particular attention, as the education of these patients at the start of dialysis may also be degraded. As we shall emphasize below, harmonized, high-quality education of patients at the start of dialysis is of paramount importance in preparing for natural or social disasters.

During the study period, only one person was hospitalized without a regular home independent nurse and was not affected by the deterioration in dialysis prescription or reuse of single-use equipment. However, access to the hospital was also difficult. The healthcare teams did not seem to identify any patients who should have been hospitalized for peritonitis but weren't because of the riots.

The information technology tools already in place before the riots greatly facilitated business continuity for the care teams. First, PD strategy modifications for APD and DPCO could be made remotely, thanks to the Sharesource® software, which enables program modifications to be sent via a modem directly to the cycler. Further, in New Caledonia, a single nephrology medical database is used by all nephrology healthcare professionals. As a result, the healthcare teams were able to access medical records easily and remotely. The online work environment also enabled effective communication, with regular videoconferences held whenever necessary.

Moreover, PD patient education at the start of dialysis was an essential aspect of continuity of care. Patients and caregivers had a common language and vocabulary, enabling efficient telephone exchanges. As a matter of routine, IDELs working with PD patients at home are given mandatory training by the PD team, allowing effective communication and collaborative work.

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The teams made every effort to maintain regular contact with both patients and IDEL throughout the seven weeks.

The "team" component was an asset in this context of rapid reorganization. The healthcare team, particularly the unit's referral doctor, had a good knowledge of PD patients and the geographical context, enabling them to carry out degraded management choices efficiently and with the greatest respect for the patients. Logistics were an important part of the job. Communication and collaboration between the care and support teams were essential. It was also necessary to communicate with the PD teams at U2nc, who are in charge of other PD patients in the region, to coordinate the care of these patients and the use of available medical equipment. Another challenge was related to the insularity of New Caledonia, with its constraints on the delivery of equipment and the impossibility of calling on neighboring countries for access to alternative equipment resources, as described by the Basnet et al. in their experience of a shortage of PD equipment in Nepal [12]. Finally, it should be noted that the riots had an impact on all dialysis patients, making access to the hemodialysis units of Atir du Grand Nouméa difficult.

Details of the reduction in dialysate volume applied over our study period were not systematically recorded in the nephrology medical record due to the disorganization of care. However, we can report that for APD patients, the prescribed volume was reduced from 12L to 6L of Dianeal. For CAPD patients, the number of bags of Dianeal was reduced from 1 per day to 1 every 2 days, combined with 1 exchange of EXTRANEAL® (icodextrin). This scheme was applied on a case-by-case basis, depending on the patient's stock, location and RRF.

Our analysis was carried out over a seven-week period. We studied the short-term consequences of changes in patient management. Further work must be conducted to study the impact on patients in the medium and long term. Data from the Registre de Dialyse Péritonéale et Hémodialyse à Domicile de Langue Française (RDPLF) will let us see the evolution of PD patients over a longer study period. It will be vital to reassess PD patients on a regular basis to identify any problems that may have gone undetected during these riots or the consequent events, such as hypervolemia, electrolyte disorders, heart failure, and hypertension. Issues concerning erythropoietin supply and delivery may have had an impact on patient hemoglobin, leading to anemia or the worsening of anemia. This deterioration in management should be studied. It would also be interesting to evaluate patients' perceptions and quality of life during the riots. Finally, we need to study the management and occurrence of events for hemodialysis patients, kidney transplant recipients, and those with chronic renal failure without replacement therapy. These complementary analyses will have to be carried out taking into account all patients managed by Atir and u2nc.

Conclusion

From this research, the main aspects that seem to be essential for good responsiveness during a crisis were the following:

1) A team medical referent with good knowledge of patients and geography ;

2) A coordinated team of peritoneal dialysis caregivers used to working together ;

3) Tools shared and accessible online for possible teleworking for those involved in the care of PD patients ;

4) Harmonized training for patients and nurses.

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Guaranteeing dialysis treatment has been a huge challenge in New Caledonia since May 13, 2024. We are convinced that the values of the New Caledonian dialysis staff and the resilience of PD patients have helped to alleviate this tragic suffering. Despite the unprecedented level of management, which went against the usual recommendations, it is reassuring to see that the efforts and vigilance of both care teams and patients meant that there was no increase in the occurrence of serious events, such as peritonitis, hospitalizations, and deaths during the study period.

Acknowledgments

Our sincerest gratitude goes to the PD nurses, nephrologists, and staff of New Caledonia's nephrology care facilities for their exceptional dedication and unwavering commitment to the care and well-being of their patients. We would also like to express our admiration to the patients who have had to cope with sudden isolation and life-threatening situations.

Conflicts of interest

The authors have declared no conflict of interest in this article.

Contribution of authors

NB and LM: data collection and article writing; NB, LM, LC, AFL, PB, BG: data interpretation and article proofreading.

ORCID
Noemie Baroux : https://orcid.org/0000-0002-3435-7222
Brigitte Glasman : https://orcid.org/0009-0004-4939-4730

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