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Age and gender disparities amongst patients on maintenance haemodialysis: a 5-year retrospective study

Disparités d'âge et de sexe chez les patients en hémodialyse chronique : une étude rétrospective de 5 ans

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Résumé

Contexte & objectif. L'âge et le sexe peuvent influencer l'évolution et l'issue des patients en dialyse. Cette étude visait à évaluer les disparités d'âge et de sexe chez les patients en dialyse chronique.

Méthodes. Il s'agissait d'une étude rétrospective de 5 ans, du janvier 2016 à décembre 2020, incluant les dossiers de tous les patients en hémodialyse d'entretien. *Résultats*. Sur les 354 patients inscrits, 63 % étaient des hommes et 21,1 % avaient de 65 ans et plus. Les patients de sexe masculin étaient plus âgés [49 ans contre 45,5 ans, p = 0,027]. Les patients de sexe masculin ont été initiés à la dialyse plus tôt que les femmes (5,56 ml/min/1,73 m^2 contre 4,85 ml/min/1,73 m^2, p = 0,060). Les patients de 65 ans et plus présentaient significativement le DFG le plus élevé au début (5,6 vs 7,86, p = 0,005). Le sexe et l'âge n'influencent pas le type d'accès vasculaire. Les patients de sexe masculin étaient plus hospitalisés (22 % contre 6,8 %, p = 0,001). Les patients de 65 ans et plus présentaient la proportion la plus élevée d'hospitalisations dans l'année suivant le début du traitement d'entretien HD (47,8 % contre 24,2 %, p = 0,001). La mortalité à un an était significativement plus élevée chez les personnes âgées (51,0 % vs 20 %, p=0,0001) et chez les patientes (33 % vs 63 %, p=0,003).

Conclusion. Une divergence entre le sexe (en faveur des hommes) et l'âge (> 65 ans) a été observée en hémodialyse chronique. Cependant, le taux de mortalité est plus élevé chez les femmes, et après 65 ans.

Mots-clés : âge, Cameroun, disparités, genre, insuffisance rénale, hémodialyse
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Summary

Context and objective. Age and gender can influence the course and outcome of patients in dialysis. This study aimed to evaluate the age and gender disparities in dialysis patients. *Methods.* This was a 5-year retrospective study of medical records of kidney failure (KF) patients who underwent maintenance haemodialysis between January 2016 and December 2020 in the Nephrology units of the Douala General Hospital and the Buea Regional Hospital. *Results.* Of the 354 patients enrolled, 63% were male and 21.1% were 65 years and above. Male patients were older, [49 years vs 45.5 years, p=0.027]. Male patients were initiated on dialysis early compared to females (5.56 ml/min/1.73 m^2 vs. 4.85 ml/min/1.73m^2, p= 0.060). Patients aged ≥ 65 years significantly had the highest glomerular filtration rate (GFR) at initiation (5.6 vs 7.86, p=0.005). Gender, and age did not influence the type of vascular access. Male patients were more hospitalized (22% vs. 6.8%, p=0.001). Patients aged ≥ 65 years had the highest proportion of hospitalizations within a year after initiation of maintenance HD (47.8% vs 24.2%, p=0.001). Mortality at one year was significantly higher in older age (51.0% vs 20%, p=0.0001) and in female patients (33% vs 63%, p=0.003). *Conclusion***.** A divergence between gender (higher in male) and age (> 65 years) has been observed in chronic haemodialysis. However, the mortality rate is higher in women, and over 65 years age.

Keywords: Kidney Failure, Haemodialysis, Age, Gender, Disparities, Cameroon
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Introduction

Women comprise an increasing proportion of the haemodialysis population worldwide (1). Despite this, there are disparities between men and women in terms of prevalence in haemodialysis units where men constitute a larger proportion (2), risk of hospitalization (3), and complications of dialysis such as anaemia and mortality (4-6). These disparities in sub-Saharan Africa are a consequence of the lower socio-economic status of women (7). Worldwide, the incidence of kidney failure (KF) in the elderly has risen in the past decades resulting in a rapidly growing number of older patients starting haemodialysis (8-9). There are still no established guidelines to inform the practice of haemodialysis in the elderly population (10). Treatment of KF in the elderly is complex and it is not clear whether the haemodialysis prescription for the elderly should be different from that of younger patients. There are no specific guidelines to inform the clinician about the practice of haemodialysis in the elderly. Ideally, optimal health care should include age and gender specificities to improve patient well-being.it is the case that most clinical guidelines apply the same dialysis protocols to men and women (1). There is also a more liberal acceptance of elderly patients to haemodialysis but in sub Saharan Africa (SSA) the data on age and gender differences with regards to haemodialysis are embryonic (11). Descriptive studies seem indispensable in this part of the world. In the dialysis population, women have a higher risk of morbidity, impaired quality of life, hospitalization and are more likely to withdraw from dialysis than men (3,16). With the limited data available in our setting, we can't confirm that those figures known globally will apply in our setting. This study aimed to determine the association between age and gender on some dialysis parameters at initiation (indication of dialysis, GFR at initiation, the type of vascular access), the dialysis vintage, the rate of hospitalization and the mortality rate of patients receiving maintenance haemodialysis.

Methods

This retrospective cohort study included 345 medical records of patients with KF initiated on maintenance haemodialysis from January 2016 to December 2020. Each patient was followed for one year after initiation for admission or death. Patient and treatment characteristics and biochemical data were collected in the file as done during routine clinical practice, and all data were analysed for two age categories (≥ 65 years and < 65 years) and to male or female gender. We also analysed treatment prescriptions and, use of vascular access.

Patients were recruited in two hospitals at two different levels of care in Cameroon's health pyramid and serving two different groups of population (urban and semi-urban) namely the Nephrology units of the Douala General Hospital (237 (66.9%)) and the Buea Regional Hospital (117 (33.1%)). The centres were chosen by convenience as both centres were the most effective (highest number of patients) for their categories. Both hospitals are government-funded and offer two dialysis per week per patient. Dialysis sessions are subsidized and the patient contribution is 5000 francs, any other need is paid out of pocket by patients and relatives and less than 5% of patients have insurance. All patients have their socio-demographic data, history, physical exam findings and subsequent follow-up recorded in files. Files are kept in the hospital registry. The age and sex of patients on maintenance haemodialysis were collected as recorded on patient files. The underlying nephropathy was recorded as stated by the nephrologist on the patient's records. The indication for haemodialysis was collected from patient files and included; Uraemia and its complications, refractory hyperkalaemia, fluid overload, pulmonary oedema, anuria and bleeding diathesis.

The type of vascular access at initiation was the first functional vascular access through which the patient was initiated on dialysis. Time of initiation referred to the estimated GFR using the MDRD formula at which a patient was initiated on

maintenance HD and late initiation was considered for GFR <5ml/min/1.73 m^2.

Paraclinical information at initiation into dialysis: Serum urea, creatinine, haemoglobin level, serum potassium, phosphorus and calcium were collected as recorded.

This study was approved by the institutional review board of the Faculty of Health Sciences of the University of Buea (2022/1551-01/UB/SG/IRB/FHS), and the administrations of the BRH and DGH. All information was stored in a password-protected computer to ensure confidentiality.

Statistical analysis

Statistical analyses were performed using Epi info 7 and MS Excel 2016. All values are presented as mean and standard deviation or counts and proportions. Comparisons were made using Student's t-test and Chi-squared analysis as appropriate. A P < 0.05 was considered statistically significant.

Results

General characteristics of the study population

As shown in table 1, 224 (63.3%) were male with a sex ratio M: F = 1.7:1. The population was young with a mean age of 48.5 (15.7) with only 21.1% aged 65 and above. Hypertension was the most common comorbidity and was present in 70% of cases. The most common cause of kidney failure was classified as 'unknown' in 40%. Hypertension, Diabetes mellitus, and chronic glomerulonephritis were the causes of Kidney Failure in 16, 11 and 20% of patients

Table 1. General Characteristics of Population (N=354)

HIV: Human immunodeficiency virus, CGN: Chronic glomerulonephritis, HIVAN: HIV associated nephropathy

Variable	Frequency (n)	Percentage (%)
Gender		
Males	224	**63.3**
Age (years)		
< 65	280	78.9
≥65	74	**21.1**
Co-morbidities		
Hypertension	243	68.6
Diabetes Mellitus	84	23.7
HIV	35	9.9
Underlying nephropathy		
Unknown	141	39.8
CGN	74	20.8
HTN Nephropathy	59	16.7
Diabetes Nephropathy	40	11.3
HIVAN	24	6.7
Other	16	4.5

Results about gender

Female patients were significantly younger (p=0.027), were initiated on dialysis late (p=0.0061) and had lower haemoglobin levels (p= 0.013) compared to male patients, while Potassium level at initiation was significantly higher (p=0.006) in the male patient (**Table 2**). As shown in the same **Table 2**, the majority of women (81.5%) and men (83%) had temporal access (CVC) for haemodialysis this difference was not significant (p=0.413). Of the 354 patients, 28.8% had records showing they were hospitalized within a year after initiation. Male patients experienced more hospitalizations (p=0.001) and also spent more days in the hospital (p=0.040). Mortality was significantly higher in Female patients (p=0.003). **Figure 1** shows indications of dialysis according to gender: Uraemia and uremic complications such as uremic encephalopathy were more

observed in male patients than female patients (62% vs 24%, OR: 2.6, p=0.012).

Table 2. Patient characteristics and laboratory results in relation to gender

Patients' characteristics		Data	Male	Female	p value
Age (years)		Mean (SD)	49.4 (15.5)	45.5 (16.1)	**0.027**
Dialysis vintage (months)		Mean (SD)	61.4 (55.8)	60.2 (60.5)	NS
GFR at initiation (ml/min/1.73 m^2)		Mean (SD)	5.56 (1.3)	4.85 (1.5)	**0.0061**
Serum calcium (mg/dl)		Mean (SD)	7.56 (1.59)	7.7 (1.52)	0.504
Serum phosphorus (mg/dl)		Mean (SD)	7.02 (3.87)	7.54 (3.55)	0.369
Serum potassium (mEq/l)		Mean (SD)	5.38 (1.46)	4.88 (1.29)	**0.006**
Serum urea (mg/dl)		Mean (SD)	229.4 (116.8)	254.5 (136.2)	0.108
Hemoglobin (g/dl)		Mean (SD)	8.28 (2.10)	7.73 (2.92)	**0.013**
Vascular Access	AVF	n (%)	38 (17)	23 (17.7)	0.413
	AVG	n (%)	0	1 (0.7)	
	CVC	n (%)	186 (83)	106 (81.5)	
Comorbidities	HTN	n (%)	149 (65.00)	93 (70.46)	0.176
	Diabetes	n (%)	56 (24.00)	28 (21.21)	
	HIV	n (%)	24 (11.00)	11 (8.33)	
Hospitalizations	Total Number n	n (%)	78 (22.00)	24 (6.8)	**0.001**
	Days Per patient/year	Mean (SD	1.45 (0.78)	1.26 (0.45)	0.150
	Number of days	Mean (SD	8.02 (4.7)	6.91 (4.9)	**0.040**
Mortality		n (%)	**33 (9.3)**	63 (17.8)	**0.003**

SD: Standard Deviation, HTN: Hypertension, AVF: arterio-vascular fistula, CVC: Central Veinous Catheter, AVG: arterio Veinous Graft, HIV: Human Immunodeficiency Virus

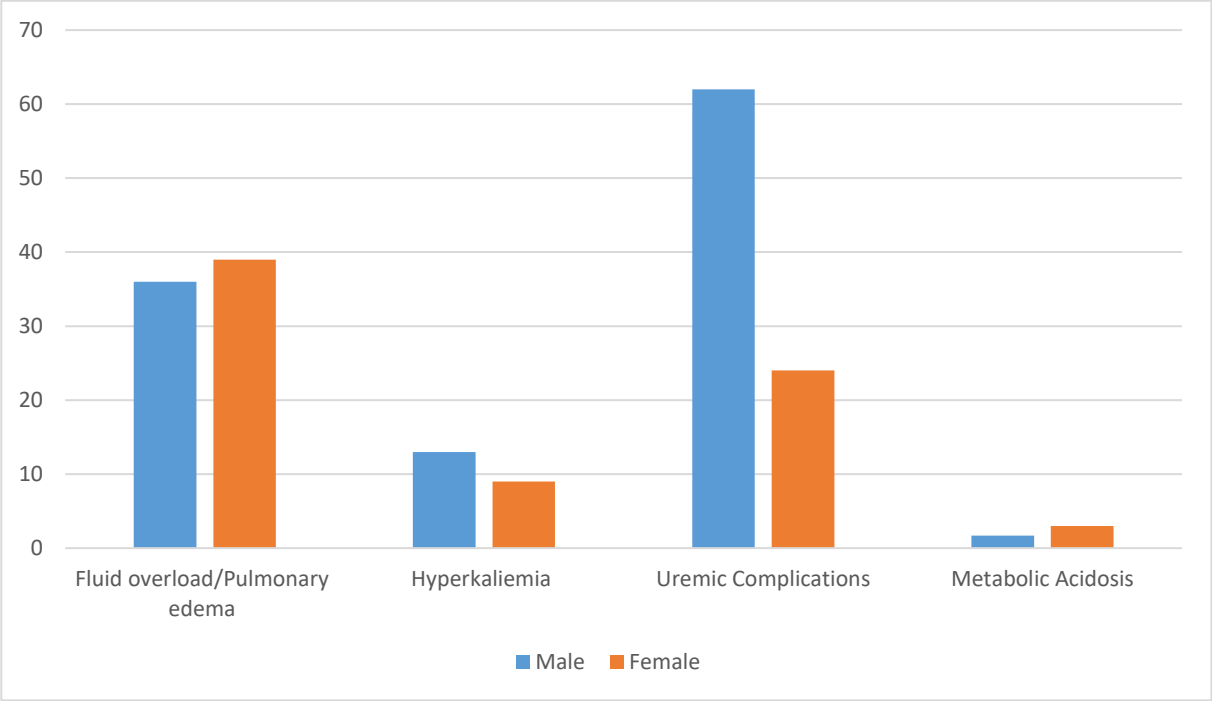

Figure 1. Indication of dialysis in relation to gender

Results

Generally, patients were initiated late in dialysis, but relatively patients aged 65 and above significantly had the highest GFR at initiation (5.6 vs 7.86, p=0.005). Hyperphosphatemia was most evident amongst younger patients (p =0.006). Anaemia was more prevalent in patients aged above 65 (85% vs 95%, p=0.0019), see table 3.

The same table 3 shows that, in all age groups CVCs were the most used vascular access at initiation. The type of vascular access was not dependent on age (p = 0.687). Patients aged 65 and above had the highest proportion of hospitalizations within a year after initiation of maintenance HD (47.8% vs 24.2%, p=0.001). Mortality at one year was significantly higher in older age (51.0% vs 20%, p=0.0001).

Figure 2 shows that uraemia was the most prevalent indication for HD after 65 years of age (36%, 50%, 62%, p=0.003), and the same fluid overload was the most common dialysis indication before 30 years of age (50%, 32%, 20%. p = 0.0434).

Table 3. Some Patient characteristics and laboratory results in relation to Age

Patients' characteristics		Data	< 65 years	≥ 65 years	p-value
Dialysis vintage (months)		Mean (SD)	64.8 (9.1)	20.5 (8.5)	**0.025**
GFR at initiation (ml/min/1.73 m^2)		Mean (SD)	5.89 (2.6)	7.86(2.2)	**0.005**
Serum calcium (mg/dl)		Mean (SD)	8.26 (1.56)	8.55 (1.46)	0.436
Serum phosphorus (mg/dl)		Mean (SD)	7.63(3.15)	6.30(2.79)	**0.006**
Serum potassium (mEq/l)		Mean (SD)	5.33 (1.31)	6.02 (1.52)	0.221
Serum urea (mg/dl)		Mean (SD)	234.51(113.9)	246.7 (116.7)	0.806
Anaemia (Hb<10 g/d)		**n (%)**	224 (80.23)	70 (95.32)	**0.019**
Haemoglobin level: Mean Hb		Mean (SD)	8.43(1.93)	8.13(3.22)	**0.345**
Vascular Access	AVF	**n (%)**	47 (17.04)	14 (19.01)	0.687
	CVC	**n (%)**	232 (83.03)	60 (81.01)	
Hospitalizations	Total Number	**n (%)**	67 (24.21)	35 (47.80)	**0.001**
	Days Per patient/year	Mean (SD)	1.42(0.62)	1.86(0.51)	0.005
	Number of days Mean	Mean (SD)	6.92(4.17)	7.96(3.39)	0.546
Mortality		**n (%)**	56(20.12)	38(51.01)	**0.001**

SD : Standard Deviation, HTN: Hypertension, AVF: arterio-vascular fistula, CVC: Central Veinous Catheter, AVG: arterio Veinous Graft, HIV: Human Immunodeficiency VirusGFR: Glomerular filtration rate

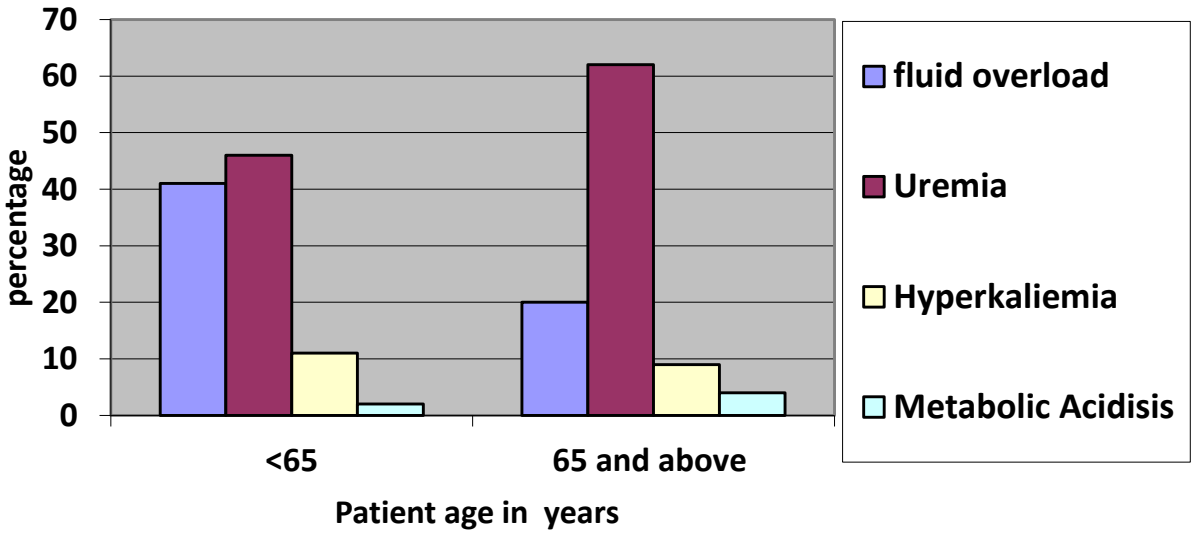

Figure 2. Indication of dialysis according to age

Discussion

Several previous observational studies have revealed significant differences in care and many argue to minimize barriers for women and the elderly to receive adequate haemodialysis and to improve practices in areas in which outcomes differ by sex or age (13-18). In this descriptive analysis, we included all prevalent haemodialysis patients with kidney failure in two dialysis centres in Cameroon and showed a male predominance, similar to Halle *et al.* in 2015 (19) and Gerard *et al.* 2016 (20). The male dominance amongst patients with KF does not come as a surprise when considering that across countries the male proportion of patients with KF always falls around 60% (21). This comes in contrast to the fact that the female population with CKD is higher than the male (22). This can be explained by a slower progression to KF in females, late referrals for kidney replacement therapy and delayed initiation of dialysis are more common in women (15,17). Other studies have suggested a greater ability of males to seek medical consultation and to meet healthcare financing requirements (14). In our study, male patients were significantly older. This difference is wildly described by Halle (19) *et al.* and many other authors. The older dialysis populations are expanding throughout the world. The increase in the older dialysis population can be attributed to the increase in the population lifespan experienced all around the world.

The ideal timing of initiation of renal replacement (RRT) therapy has been debated but it is known that women start hemodialysis at an estimated GFR that is on average lower than in men (21), this was consistent with our findings. This is mainly explained by the lower economic power of women, especially in SSA. Hence women find it difficult to afford HD. In total, 62.4% of patients commenced haemodialysis at an estimated GFR of <5ml/min/1.73 m^2. This was different from the 23% gotten by Obrador et al in the USA (23). This could be attributed to a better healthcare system with a priority on preventive medicine. This study shows a tendency of older patients to be initiated early. Age has not been a major concern for dialysis initiation except for older elderly where studies have shown that they start dialysis late compared to younger patients, and that early dialysis in that group of patients was not associated with any survival benefit (24-26). This study shows that older age was usually associated with early dialysis initiation. This was also found by Soler *et al.* (27). Older age, greater likelihood of diabetes and the presence of severe comorbid diseases may partly explain this effect as these conditions can not only aggravate Uraemia but also mimic the uremic syndrome and precipitate the initiation of dialysis.

In the general population, healthy women are known to have lower levels of haemoglobin than men. This was the same in our study which showed women having a lower mean level of Hb and a higher proportion amongst patients with severe anaemia. Though these results were not statistically significant, they were similar to those obtained by a multicentre analysis done in Europe (1). Of the complications of KF, one of the most prominent is CKD-MBD. In our study, patients less than 65 years old were significantly more affected by hyperphosphatemia. Older age and hypoalbuminemia are well-established risk factors

of hypophosphatemia in dialysis patients, some authors have explained this as a consequence of malnutrition which is more prevalent in older dialysis patients (28). This has been associated with increased mortality and morbidity amongst patients on maintenance HD (29) and should be taken into account.

Patients on dialysis have an extremely high risk of requiring admission to an acute care hospital (hospitalization) relative to the general population (30). Previous reports in Cameroon failed to show a correlation between age, gender and rate of admissions (31-32). In this study, Males were significantly more hospitalized within a year following initiation. This was contrary to Hecking *et al.* 2014 (2) and Adams *et al*. 2017(3). Mehrotra et al 2013 (33) established that higher GFR at initiation was associated with higher morbidity and mortality and we have shown that males were initiated earlier compared to females. Also in this study, elderly patient (≥65 years) were more admitted than the younger. Co-morbidities, early initiation, and malnutrition as they also show lower phosphorus may explain the higher rate of admission.

The mortality rate was higher in patient aged 65 and above. Teuwafeu et al (34) showed that elderly in dialysis the median survival time was low (7.5 months) (IQR 0.7–12.0 months) and the survival rate at one year was 41%. Females are known to have a better survival rate than males in the general population, but previous studies have shown that this superior survival is diminished in patients on dialysis (35-36). We reported here more significant death in females similar to Wai H. Lim *et al*. (37). This study also demonstrated that female patients were initiated late compare to male patients. Early or late dialysis and survival is still a debate but previous report have established some survival benefit if dialysis is initiated early (38). The differences in cause-specific mortality between male and female incident dialysis patients with kidney failure are not well understood and were the focus of this study.

Limitations

This was a retrospective study with all its shortcomings: inferior level of evidence compared with prospective studies, convenience sampling, and may not be representative of the general population of dialysis in Cameroon and prone to selection, recall or misclassification bias. Also the survival rate couldn't be express as Kaplan-Myer Curve to ease comprehension and analysis of the mortality.

Conclusion

Our study was conducted in two HD centers in Cameroon, to describe the disparities in terms of gender and age amongst patients with KF on maintenance HD. In our study, 2 out of every 3 patients were male and the population was young with only 21.1% of patients ≥ 65 years. Male patients and Patients ≥ 65 years were initiated at relatively higher eGFR. Male patients were more affected by hyperkalemia and anaemia was significantly more present in female patients. Male patients and patients ≥ 65 years had higher rates of hospitalization within a year after initiation into maintenance HD. The female gender, older age showed a higher mortality rate.

Statements and declarations

Ethical considerations

This study was approved by the institutional review board of the Faculty of Health Sciences of the University of Buea, and the administrations of the BRH and DGH. All information was stored in a password-protected computer to ensure confidentiality.

Consent for publication

Not applicable

Availability of data and materials

Not applicable

Competing interest

The authors declare that they have no competing interests

Funding

Not applicable

Authors' contributions

TDG, PLR, HMP drafted and revised the work, PLR, HMP, TDG, RGB drafted the work and collected data, TDG, EL, HMP, RGB analysed and interpreted data, HMP, AG revised the work.

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