



Pharmacist's role in HIV care in France. Implication for clinical improvement of people living with HIV worldwide

Christine Jacomet¹ | Julie Langlois² | Solene Secher³ | Dilek Coban⁴ |
Celine Lambert⁴ | David Zucman⁵ | Herve Trout⁶ | Rene Maarek⁷ | Eric Billaud⁸ |
Agnes Certain⁹

¹Infectious Disease Unit, CHU Clermont-Ferrand, COREVIH Auvergne Loire, Clermont-Ferrand, France

²Société Française de Lutte Contre le SIDA, Paris, France

³COREVIH Pays de la Loire, CHU Nantes, Nantes, France

⁴Clinical Research Direction, CHU Clermont-Ferrand, Clermont-Ferrand, France

⁵ZUCMAN David: Internal Medicine Unit, Hôpital Foch, Suresnes, France

⁶TROUT Hervé: Pharmaceutical Service, Hospital Group Lariboisière Saint Louis and Fernand-Widal, Paris, France

⁷MAAREK René: Pharmacist, Montreuil, France

⁸BILLAUD Éric: Infectious Disease Unit, CHU Nantes, CIC 1413 INSERM, COREVIH Pays de la Loire, Nantes, France

⁹CERTAIN Agnès: Infectious Disease Unit, CHU Bichat-Claude Bernard, Paris, France

Correspondence

Christine Jacomet, Infectious Disease Unit, CHU Clermont-Ferrand COREVIH Auvergne Loire, 63000 Clermont-Ferrand, France.
Email: cjacomet@chu-clermontferrand.fr

Abstract

In France, antiretroviral (ARV) treatment can be dispensed by hospital and/or community pharmacies. Since January 2016, an online patient medication file can be used to optimize dispensing, but medication interviews have not yet been incorporated into this system. To understand both people living with HIV (PLHIV) and their pharmacists' habits and expectations of patient medication file and interviews, two consecutive national surveys were organized. The first one, carried out in October 2016 in care centers, was an anonymous questionnaire for PLHIV. The second one was an online survey for community and hospital pharmacies conducted in February 2017. A total of 1137 PLHIV (68% men, of mean age 50.2 ± 11.5 years, CD4 count 671 ± 354 , 90% with undetectable HIV viral load (VL) and 64.2% reporting comorbidities) and 246 pharmacies responded. While the existence of the online medication file is known by 58% of PLHIV, only 40% of pharmacists declare it to be systematically offered. It was offered to 120/694 (17%) PLHIV and 96 (80%) accepted it. Currently, 78 (7%) PLHIV feel well taken care of because they are offered medication interviews, 343/1078 (32%) would like to take advantage of this program, mainly those with a shorter ARV duration (OR ARV duration 0.97 [0.95-0.99]), a VL less often undetectable (OR undetectable VL 0.55 [0.31-0.98]), and those who feel anxious more often (OR anxious 2.38 [1.48-3.84]). These results suggest that better implementation of medication files and interviews will strengthen current clinical pathways.

KEYWORDS

antiretrovirals, clinical pharmacy, health policy, HIV/AIDS, patient safety

Abbreviations: ARV, antiretroviral; CNIL, French National Commission for Data Protection and Liberties; COREVIH, anti-HIV regional coordination task group; FHDH, French hospital database on HIV infection; HIV, human Immunodeficiency virus; MCA, multiple correspondence analysis; PLHIV, people living with HIV; PTE, patient therapeutic education; URPS, regional Union of Health Professionals; VL, viral load.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2020 The Authors. *Pharmacology Research & Perspectives* published by British Pharmacological Society and American Society for Pharmacology and Experimental Therapeutics and John Wiley & Sons Ltd

1 | INTRODUCTION

In France in 2016, there were an estimated 6000 HIV new infections, leading to 172 700 people living with HIV (PLHIV), 76% of whom received antiretroviral (ARV) treatment.¹ Pharmacists are responsible for dispensing medication optimally, in particular ARV drugs whose role in reducing transmission and halting progression toward AIDS is essential.^{2,3} In our country, HIV care is mainly hospital-centered while pharmaceutical care is not. If double dispensation (in hospitals and in community pharmacies) exists, 70% PLHIV prefer community pharmacy dispensing as France has a dense neighborhood network of pharmacies.⁴ However, relatively few ARVs are dispensed by each pharmacy each day. There is no remuneration in place for the pharmacist's services to PLHIV even though ARV regimen can be complex, and can sometimes be combined with treatments for opportunistic infections and/or hepatitis B and C, and/or often with treatments for comorbidities associated with prolonged HIV infections (cardiologic, metabolic, digestive, or neuropsychiatric) and very often with self-medication.⁵ These drugs require precise pharmacological analysis and management of drug interactions, with heightened pharmacovigilance.⁶ This is especially important because after the infection stabilizes, a current care pathway only require bi-annual or annual hospital consultations where an ARV prescription is given for the following 6 months, or year.⁷ During this 6-month or 12-month period, the pharmacist (hospital pharmacist or community pharmacist, according to the patient's preference) is often the only health professional a PLHIV will meet monthly, and who must ensure adherence to the treatment regimen. Another major challenge for the pharmacist can be patient therapeutic education (PTE) in conjunction with the various actors involved. It is likely that PTE, despite being recommended in HIV care, is only infrequently offered by the hospital care actors or solicited by the patients: in our precedent study, specialized HIV care nurses provided therapeutic education to only 5% patients.^{4,6,7}

Some other features of the French health system can complicate a patient's care pathway, such as the coexistence of public and private care or the existence of private additional insurances. The coordination of care requires a complex collaborative effort to ensure the patients' free circulation within the care system.

For cost-controlled medical care ("better care through better spending"), coordination of care and health actors has become essential. Thus, since January 2016, an online patient medication file can be used to favor optimal dispensing. When this file is offered by the pharmacist and accepted by a patient covered by health insurance, it can be used to record all the drugs dispensed during the previous 4 months (21 years for vaccines and 3 years for biological tests), whether they were prescribed by a general practitioner, another physician, or taken on a pharmacist's advice. This file thus constitutes a tool for coordinating prescriptions, generating advice, and identifying precautions in use, all of which are of benefit to the patient.⁸ The pharmacist can also draw attention to the monitoring and pursuit of certain treatments such as oral anticoagulants and anti-asthmatic drugs, but not ARV drugs.⁹

Two surveys were organized. The first one, intended for PLHIV, was designed to find out more about their habits and their expectations of their pharmacist, to assess how well the medication file and medication interview were accepted, and to profile them. The second one, geared toward pharmacists, sought information about how ARV and/or other prescribed or self-prescribed medication drugs were being dispensed, how often the medication file and medication interviews were offered, the profiles of the pharmacies concerned, and, finally, the pharmacists' readiness to conduct medication interviews on monthly dispensing of ARV drugs.

2 | MATERIALS AND METHODS

Our first national survey of PLHIV took place on the week of 12-18 October 2016. All centers which had been informed beforehand by the anti-HIV regional coordination task group (COREVIH), supervisors and the pharmacists' branch of the Regional Union of Health Professionals (URPS), and which agreed to participate were recruited. All the consecutive PLHIV under ARV treatment admitted in clinical units or hospital pharmacies who agreed to participate were offered to answer the questionnaire, unless they were minors or under guardianship. Those who accepted answered anonymous self-questionnaires collecting demographic and medical data (the latter mostly comprised their biological results available on site), current dispensing patterns for all drugs, co-prescriptions and self-medication, their views on the medication file and medication interviews, and any requests they might have.

Our national survey of pharmacists took place during February 2017 for community and hospital pharmacies recruited by the pharmacists' branch of the URPS, supervisors, and wholesale suppliers. The fully anonymous survey was conducted online; the pharmacies were questioned once only.

2.1 | Ethics

The study and the text of the survey were approved by the Clermont-Ferrand Ethical Review Board. The addresses of the participating centers were collected beforehand by the Clermont-Ferrand university hospital under the terms of the French National Commission for Data Protection and Liberties (CNIL) (N°0177- September 2016). All the questionnaires were anonymous.

2.2 | Statistics

All the analyses were carried out using Stata software (version 13, StataCorp, College Station, Texas) and R 3.3.3 software (<http://cran.r-project.org/>). All tests were two-sided with a type I error set at 0.05. The populations were described by numbers and associated percentages for categorical variables and by means \pm standard deviation or median [interquartile range] for quantitative variables,

according to their statistical distribution (normality checked by the Shapiro-Wilk test).

The percentage of PLHIV who considered that the pharmacist dispensing the ARVs ought to offer medication interviews, and the percentage of PLHIV who would have accepted the medication file if it were offered are presented with a 95% confidence interval.

A multiple correspondence analysis (MCA) followed by a mixed unsupervised classification (k-means clustering applied to the partition obtained from an ascending hierarchical classification using Ward's distance) was also implemented to (a) study the relations between the modalities of the variables and (b) determine PLHIV profiles (clusters of individuals sharing closely similar characteristics). For this analysis, the variables were chosen according to clinical relevance and to statistical distribution (parameters always present or always absent were not considered)—as age, gender, in work, ARV duration, ARN VIH, comorbidities, etc listed in Table 1. Only individuals without missing data were used for MCA.

This exploratory analysis was completed by comparing different groups of subjects (community vs hospital pharmacy to collect ARVs, acceptance vs refusal of interviews, etc) using usual inferential statistical tests: (a) Student's t-test or Mann-Whitney test if the conditions for the t-test were not met (homoscedasticity checked by the Fisher-Snedecor test, and normality by the Shapiro-Wilk test) for quantitative variables, and (b) Chi-squared test or Fisher's exact test as appropriate for categorical variables. Multivariate logistic regressions (for dichotomous-dependent variables) were performed considering the covariables in light of the results of univariate analysis and their clinical relevance (eg, gender, age, length of illness, and duration of treatment). The results are expressed as odds ratio (OR) and 95% confidence interval (CI).

3 | RESULTS

In all, 98 centers (68 hospital clinical units, 15 hospital pharmacies, and 15 community pharmacies) throughout France took part in the first survey. They saw 1213 PLHIV for either consultation or dispensing—between 1 and 77 patients per center. Of these, 57 patients refused to take part (too busy, not interested, and other reasons), and 19 others did not reply (reading difficulties). A total of 1137 PLHIV filled out a questionnaire (participation rate 94%).

In all, 246 pharmacies (38 hospital and 208 community) throughout France answered the online questionnaire in the second survey.

3.1 | Characteristics of the people living with HIV

The characteristics of PLHIV are shown in Table 1. They were on average 50.2 ± 11.5 years old and 68.3% were men. The viral load (VL) was mostly undetectable (89.7%) and 64.2% of PLHIV had an associated disorder.

A MCA was carried out on the 625 PLHIV with no missing data. The characteristics of the people excluded from the MCA were similar

TABLE 1 Sociodemographic and medical characteristics of the people living with HIV (PLHIV) included

	N	n (%) mean \pm SD ^a
Demographic characteristics		
Male gender	1134	775 (68.3)
Age (years)	1112	50.2 \pm 11.5
Lives in IDF/DOM/PACA ^b	989	424 (42.9)
Lives in town	1098	859 (78.2)
In work	1111	613 (55.2)
Lives with partner	1113	491 (44.1)
HIV ^c infection and treatment		
Duration of antiretroviral treatment (years)	959	11.9 \pm 8.2
CD4 count	874	671 \pm 354
Undetectable viral load	920	825 (89.7)
Care of associated disorders		
Associated disorder	1128	724 (64.2)
Hypertension	724	205 (28.4)
High cholesterol	724	182 (25.2)
Diabetes	724	73 (10.1)
Heart problems	724	109 (15.1)
Sleeping difficulties	724	180 (24.9)
Anxiety, stress	724	207 (28.6)
Tiredness	724	126 (17.4)
Digestive problems	724	140 (19.4)
Pain	724	223 (30.8)
Other health disorders	724	1 (0.9)

^aStandard deviation.

^bÎle-de-France Region/overseas departments/Provence-Alpes-Côte-d'Azur Region

^cHuman immunodeficiency virus.

to those who took part except that they were more often female (180/509 (35.4%) excluded vs 179/625 (28.6%) included, $P = .02$) and lived more often outside the Île-de-France region, French overseas departments and the Provence-Alpes-Côte-d'Azur region (236/364 (64.8%) excluded vs 329/625 (52.6%) included, $P < .001$). The MCA and the mixed unsupervised classification highlighted three clusters of PLHIV (Figure 1). In the first cluster ($n = 373$; 59.6%), PLHIV were characterized by the absence of any health problem other than HIV (no high cholesterol, sleeping difficulties, anxiety, digestive problems, hypertension, pain, tiredness, heart problems, or diabetes). In addition, 77% of individuals aged below 50 years, 73% of those in work, and 79% of those receiving ARVs for less than 6 years belong to this cluster. This first cluster thus comprised mostly "young working" individuals. Those in the second cluster ($n = 137$; 22.0%) were people aged over 50 years, with no sleeping difficulties, tiredness, or anxiety, and were mostly male (85%). They presented risk factors and/or cardiovascular diseases: 90% of the diabetics were in this group, along with 75% of those with high cholesterol, 60%

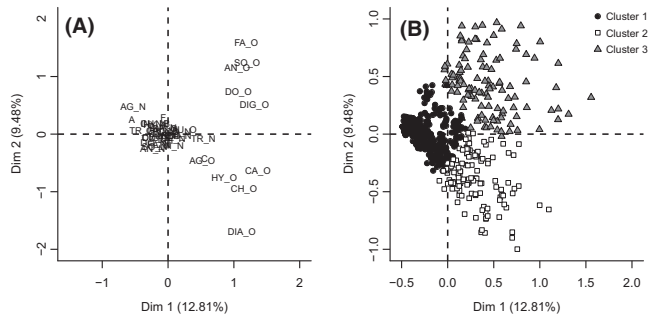


FIGURE 1 Modalities of the variables (A) and position of the individuals (B) on the first two axes resulting from the multiple correspondence analysis (MCA). A, The relationships between the categories of the variables can be interpreted as follows: categories with a similar profile are closed to each other, negatively correlated categories are positioned on opposite sides of the chart's origin, the distance between categories and origin measures the quality of the categories (distant points from the origin are well represented by the MCA). B, Factorial analysis revealed three profiles of PLHIV. AG_N: age \leq 50, AG_O: age $>$ 50, AN_N: no anxiety disorders/stress, AN_O: anxiety disorders/stress, ARV_A: ARV duration \leq 6 years, ARV_B: ARV duration between 7 and 17 years, ARV_C: ARV duration \geq 18 years, AU_N: no other disorder, AU_O: other disorders, CA_N: no heart problems, CA_O: heart problems, CD4_N: CD4 \leq 500, CD4_O: CD4 $>$ 500, CH_N: no cholesterol, CH_O: cholesterol, CO_N: do not live in a relationship, CO_O: lives in a relationship, DIA_N: no diabetes, DIA_O: diabetes, DIG_N: no digestive problem, DIG_O: digestive problems, DO_N: no pain, DO_O: pain, F: woman, FA_N: no fatigue, FA_O: fatigue, H: men, HY_N: no high blood pressure, HY_O: high blood pressure, IDP_N: do not live in Ile-de-France, DOM or Provence-Alpes-Côte d'Azur, IDP_O: lives in Ile-de-France, DOM or Provence-Alpes-Côte d'Azur, IN_N: detectable viral load, IN_O: undetectable viral load, SO_N: no sleeping troubles, SO_O: sleeping troubles, TR_N: nonworking, TR_O: working, VI_N: do not live in town, VI_O: lives in town

of those with hypertension, and 57% of those with a heart condition. This cluster is labeled “males with cardiovascular risk”. The third cluster ($n = 115$; 18.4%) composed of people without diabetes or heart conditions, but 75% of those suffering from anxiety, and 80% of those with sleeping difficulties or tiredness. This cluster is labeled the “anxious” group.

3.2 | Characteristics of the pharmacies and dispensing by pharmacists

The characteristics of the pharmacies that responded to the second survey are given in Table 2. Majority were 43.8 years old female, had one employee, and dispensed in urban area less than 150 patients per day. Very few had problem with ARV dispensation.

3.3 | Dispensation as experienced by the PLHIV

Of the 1128 PLHIV who answered this questionnaire, 318 (28.2%) collected their ARVs in a hospital pharmacy, 729 (64.6%) in a

community pharmacy, and 81 (7.2%) in one or the other indifferently. More PLHIV belonging to clusters 1 and 2 collected exclusively their ARV in a hospital pharmacy than cluster 3 (26.0%, 25.5%, and 15.7%, respectively, $P = .02$). We could specify by multivariate analysis the factors associated with strict hospital dispensing to be female sex (OR male 0.62 [0.40-0.96], $P = .03$), greater age (OR 1.03 [1.01-1.05], $P = .02$), employed (OR job 1.76 [1.14-2.74], $P = .01$), and suffering less frequent anxiety (OR anxiety 0.45 [0.25-0.83], $P = .01$). For the 787 PLHIV who went sometimes or always to a community pharmacy, this was their usual pharmacy in 689 cases (87.5%). No particular sociodemographic or medical characteristics such as HIV VL or CD4 cell count could be identified.

In all, 1108 respondents evaluated the current dispensing of their ARVs. In terms of the different response choices offered, 729 (65.8%) felt well cared for because the dispensing was confidential, 541 (48.8%) because the stock of ARVs was sufficient so they did not have to come back several times, and 78 (7.0%) because “medication advice” was offered to them. Although there was no relationship with one of the three clusters of patients, these last 78 respondents went less often to community pharmacists for their ARVs (OR community 0.38 [0.17-0.84], $P = .02$) and lived less often with a partner (OR partner 0.47 [0.22-0.99], $P = .047$). For 96/1108 PLHIV (8.7%), close proximity, attentiveness, and the management of drug interactions were also important variables.

In addition, of these 1108 PLHIV, 7.0% considered that their pharmacist could help with their compliance—mostly those who were unemployed (OR job 0.52 [0.28-0.95], $P = .04$)—4.5% with their unwanted side effects—mostly those who were anxious (OR anxiety 2.46 [0.03-5.85], $P = .04$) and unemployed (OR job 0.20 [0.07-0.52], $P = .001$)—and 5.3% with their drug interactions—mostly those who were anxious (OR 8.03 [3.32-19.40], $P < .001$). Moreover, 9.6% of the third cluster considered that their pharmacist could help them manage their drug interactions vs 1.1% and 1.5% in clusters 1 and 2, $P < .001$.

3.4 | The medication file

While 475/1137 PLHIV (41.8%, 95% CI: 38.9 to 44.7%) had never heard of the medication file, they were offered by a pharmacist to only 120/694 of them (17.3%, 95% CI: 14.4 to 20.2%), and accepted by 96/120 (80.0%, 95% CI: 72.7 to 87.3%). No relationship with the different clusters of patients was found ((see Table 3)).

Interestingly, the community pharmacies answered that 70/177 (39.5%) offered it systematically.

3.5 | Future medication interviews

When PLHIV were asked whether they would be interested in interviews with their pharmacists during ARVs dispensing, where they could receive explanations about efficacy and tolerance, recommendations for proper use of their medication, and advice about

TABLE 2 Characteristics of the 246 pharmacies recruited

	All pharmacies (N = 246)	Hospital pharmacies (N = 38)	Community pharmacies (N = 208)
Male gender	94/218 (43.1)	6/31 (19.4)	88/187 (47.1)
Age (years)	43.8 ± 11.4	43.5 ± 10.9	43.9 ± 11.6
No. of pharmacists working in the pharmacy			
1	24/183 (13.1)	–	24/183 (13.1)
2	76/183 (41.5)	–	76/183 (41.5)
3	62/183 (33.9)	–	62/183 (33.9)
≥4	21/183 (11.5)	–	21/183 (11.5)
No. of patients received per day			
<150	116/213 (54.5)	25/28 (89.3)	91/185 (49.2)
150-300	76/213 (35.7)	1/28 (3.6)	75/185 (40.5)
>300	21/213 (9.8)	2/28 (7.1)	19/185 (10.3)
Location			
Shopping center	59/218 (27.1)	1/31 (3.2)	58/187 (31.0)
Rural area	5/218 (2.3)	0/31 (0.0)	5/187 (2.7)
Urban area	154/218 (70.6)	30/31 (96.8)	124/187 (66.3)
Confidentiality area	185/227 (81.5)	31/36 (86.1)	154/191 (80.6)
PTE ^a training	67/234 (28.6)	19/36 (52.8)	48/198 (24.2)
Participation in PTE ^a program	79/225 (35.1)	20/36 (55.6)	59/189 (31.2)
No. of patients collecting dispensed ARV ^b	3 [1; 6]	140 [10; 350]	3 [1; 5]
Problems of ARV ^b dispensing	12/216 (5.6)	2/32 (6.3)	10/184 (5.4)
Present or past contact with prescribers			
For some patients	97/223 (43.5)	26/35 (74.3)	71/188 (37.8)
For all patients	15/223 (6.7)	6/35 (17.1)	9/188 (4.8)
Never	111/223 (49.8)	3/35 (8.6)	108/188 (57.4)

^aPatient Treatment Education.^bAntiretroviral regimens.

any drug interactions, 1078 responded (see Table 4). All in all 343 could accept interviews and 735 couldn't. Bearing in mind that several answers were possible per respondent, 233 (21.6%) would agree to interviews to improve their knowledge and therefore help them manage their anti-HIV treatment, 204 (18.9%) would have participated to improve their follow-up and compliance, and 140 (13.0%) to improve their relation with their pharmacist. However, 549 (50.9%) PLHIV were not interested, and 125 (11.6%) did not have time. The others didn't specify any reason.

Focusing on the 343/1078 (31.8%) people who would have agreed to interviews for medical reasons (knowledge, management of treatment, and/or follow-up), they were mostly PLHIV belonging to cluster 3 rather than clusters 1 and 2 (39.8%, 24.9%, and 28.5%, respectively, $P = .008$), with a shorter ARV treatment history (OR duration ARV 0.97 [0.95-0.99], $P = .04$), a less frequently undetectable VL (OR undetectable VL 0.55 [0.31-0.98], $P = .04$), and anxiety-prone (OR anxiety 2.38 [1.48-3.84], $P < .001$). The PLHIV wanting to improve their relation with their pharmacist showed no

particular sociodemographic or medical characteristics. The PLHIV who were not interested in interviews belonged more often to clusters 1 and 2 than 3 (68.9%, 59.2%, and 51.3%, respectively, $P = .001$) and were less anxiety-prone (OR anxiety 0.47 [0.29-0.75], $P = .001$).

Of the community pharmacists participating, 142/172 (82.6%) found that establishing medication interviews was important, and 74/136 (54.4%) thought it should encompass all PLHIV (Table 4). On the other hand, 62/136 respondents, 45 (72.6%) wanted interviews to be set up only in cases of a recent HIV diagnosis, 30 (48.4%) when other medications are being taken, 29 (46.8%) when noncompliance was suspected, 26 (41.9%) to allay patient anxiety, and 25 (40.3%) when self-medication was practiced.

Among the topics that patients would have liked to address, according to the pharmacists, the most important was the management of unwanted side effects, forgotten doses, noncompliance, and drug interactions. To deal with these topics, more training would be necessary according to 94% of the pharmacists, mainly through continuous training programs (68%), above all centered on patient

TABLE 3 Offer of medication file by pharmacists, and response by people living with HIV (PLHIV)

	n (%)
Offer of medication file by pharmacists	N = 177
Never	18 (10.2)
No time	5/18 (27.8)
Systematic refusal	13/18 (72.2)
No point	2/18 (11.1)
Not applicable	15 (8.5)
Depends on work load	19 (10.7)
Depends on patients	55 (31.1)
Other chronic disease	19/55 (34.5)
Lives near pharmacy	3/55 (5.5)
Already seen several times	39/55 (70.9)
Systematically	70 (39.5)
Response of PLHIV N = 1137	N = 1137
Not heard of medication file	475 (41.8)
Offer of medication file	120/694 (17.3)
Never	494 (42.7)
Yes, at least once	120 (17.3)
Acceptance	96/120 (80.0)

support and representations of HIV infection (72%) and overall care (71%).

4 | DISCUSSION

With factorial analysis, three PLHIV groups were identified, young and working people who represent around 60% of all of them, males with cardiovascular disease (22%) and those living with anxiety (18%). Current dispensing of ARVs in hospital or in community pharmacies is associated with these PLHIV profiles. Satisfaction of PLHIV was primarily because of confidentiality, followed by good stock availability, the offer of personalized advice from the pharmacist, management of noncompliance, side effects, and drug-drug interactions management particularly for those living with anxiety. Among the pharmacists surveyed, the dispensing of ARVs, most often confidential, did not raise any particular problem—but almost 80% of pharmacies did not know if other treatments were dispensed elsewhere. The existence of the medication file was known by fewer than half of the PLHIV—and only one third of the pharmacists declared that they offered it—but it was most often accepted when offered. However, most of the pharmacists did not expect such high acceptance. The medication interview in hospital and/or community pharmacies would have been accepted by one third of the people receiving ARVs, at treatment initiation or shortly after ARV switch, and anxiety-prone PLHIV. The PLHIV who would benefit from these interviews and who would accept them seemed to be well identified

by the pharmacists themselves. To set up these interviews, the pharmacists wanted additional training, mainly oriented toward support and global care of PLHIV.

Certainly, centers and pharmacies were volunteer-recruited and this is the main limitation of the study. The centers and pharmacies involved were probably already interested in the subject. However, the number of centers and pharmacies, their different sizes, and their geographic location throughout the French territory could overcome a part of this recruitment bias. Moreover, the “in a given week” survey methodology with a 94% patient participation rate compensated for the selection bias of PLHIV. Besides, the characteristics of the PLHIV in this study seem to be the same as those of the PLHIV in the French hospital database on HIV infection (FHDH), with a sex ratio of 2/3 men due to the epidemic among MSM in our country. Precisely, in 2016 in France, median age of PLHIV was 49.9 years old [IQR: 41.6-56.9], 65.4% were male and 61.2% were born in France, 89.7% had undetectable VL, and 68% had CD4 cell count > 500 mm³.¹⁰ Thus, PLHIV recruited can be considered representative of the French PLHIV population. However, they seem to present more numerous comorbidities than those previously reported.^{1,7} Though, as we noted in the present study, our self-questionnaire focused more closely on “disorders” than on identified organ diseases. Nevertheless, the HIV Outpatient Study (HOPS) had already emphasized the high percentage of people receiving prescribed medication associated with the ARV treatment for comorbidities linked to aging, anxio-depressive syndromes imperfectly diagnosed by HIV specialists (reported by the Vespa 2 study in France), or probable self-medication for unwanted side effects and ill-defined symptoms (pain, anxiety, and digestive disorders), such as NSAIDs and PPIs, with undesirable side effects and deleterious interactions with ARVs.^{11,12} Our findings might comfort these characteristics without metabolic or cardiovascular comorbidities but anxiety, tiredness, and sleeping difficulties are displayed in group 3 and represents around 18.4% of PLHIV. All in all, multiple medication is more frequent than in the general population, and can be associated with poor compliance, which would justify specific therapeutic interviews.^{13,14}

Furthermore, even if this survey took place in 2016 and 2017, the situation with respect to pharmaceutical care for PLHIV is still the same in France.

Our results are in line with those of several recent studies that found ARVs were dispensed mostly in community pharmacies and in the patient's “usual” pharmacy, with no difference in achieving undetectable VL, and mean CD4 count, between the choice of hospital pharmacies or traditional community ones. These results are different from previously published studies.¹⁵⁻¹⁷ There was no difference between urban and rural areas, or between areas of high and low HIV prevalence regarding the place where ARVs were dispensed. We note that in France, community pharmacies form a dense neighborhood network where qualified licensee pharmacists own their businesses, providing patients and public health care with an unequalled degree of protection. Simplified treatments might suggest that it is now easier to obtain community dispensing in greater

TABLE 4 Future medication interviews

PLHIV ^a : comparison according to wish for interview with the pharmacist for better compliance and/or knowledge of ARV ^b treatment				
	Acceptance of interviews (N = 343)	Refusal of interviews (N = 735)	p [*]	p ^{**}
Male	232 (67.6)	507 (69.0)	.63	.99
Age (years)	49.4 ± 10.7	50.2 ± 11.8	.46	.71
Lives in town	265/330 (80.3)	555/718 (77.3)	.33	.93
In work	183/335 (54.6)	405/723 (56.0)	.54	.71
Lives with partner	131/335 (39.1)	332/724 (45.9)	.06	.71
Duration of ARV treatment (years)	10.7 ± 7.8	12.2 ± 8.3	.01	.04
CD4 count	648 ± 310	682 ± 375	.30	.91
Undetectable viral load	229/266 (86.1)	557/611 (91.2)	.02	.04
Other treatment	235/341 (68.9)	452/731 (61.8)	.02	.53
Anxiety	81/341 (23.8)	118/730 (16.2)	.001	<.001
Dispensing in hospital pharmacy	97/339 (28.6)	202/733 (27.6)	.92	.07
Pharmacists: answers about medication interviews				
Usefulness of interviews			142/172 (82.6)	
Difficulties setting up			74/167 (44.3)	
Patient refusal			35/74 (47.3)	
Lack of time			27/74 (36.5)	
Lack of competencies			26/74 (35.1)	
% Patients interested				
≤30%			61/150 (40.7)	
50%			45/150 (30.0)	
≥75%			44/150 (29.3)	
Patients probably interested				
All			74/136 (54.4)	
Recent infection			45/136 (33.1)	
With other associated treatments			30/136 (22.1)	
Noncompliant			29/136 (21.3)	
Anxious			26/136 (19.1)	
Self-medication			25/136 (18.4)	
Alone			14/136 (10.3)	
Already attended			13/136 (9.6)	
Older			12/136 (8.8)	
Male			7/136 (5.1)	
Unemployed			2/136 (1.5)	

Note: Data are presented as number of subjects (associated percentages) or mean ± standard deviation. p^{*}, univariate analysis, p^{**}, multivariate analysis.

^aPLHIV, people living with HIV.

^bRV, antiretroviral.

confidentiality. Nonetheless, the figure of 70% for community dispensing ARV is stable, and for the last 5 years some 30% of patients, predominantly female, older, employed, and less anxiety-prone, have still preferred hospital dispensing, a finding specific to France, with viral hepatitis medication.^{4,18} A recent thesis in pharmacy, in a

survey on PLHIV who went for their ARV medication to the hospital pharmacy at the Rennes teaching hospital reports that: the older patients, seropositive for more than 20 years, wanted the hospital dispensing to continue, fewer of them informing their local community pharmacist that they were being given ARVs in the hospital when

they collected medication for comorbidities.¹⁹ Hospital dispensing is also preferred by employed people, and by women, a large proportion of whom are of African origin.²⁰⁻²² This may be for greater confidentiality, in which we could glimpse evidence of a persistent feeling of stigma. Whatever the cause may be, such dispensing is associated with less anxiety.

Concerns about medication file were well examined by Gilbert in 2016 and Barnes in 2020, in terms of adherence rate, VL, and CD4 count in clinics—highlighting the impact of HIV-trained pharmacists embedded in clinical services.^{23,24} In our study, the high level of PLHIV with undetectable HIV VL (nearly 90%) is maintained whatever the mode of dispensing. Despite this high level, the large acceptance of the patient medication file (80%) might encourage pharmacists and compel them to offer more clinical activity as patients will age and be prescribed treatments for comorbidities. In some countries, adequate checks for drug interactions are facilitated by an online medication file or a merging of pharmacies' data to a central database. In the same way, it is a pity that only 7% of patients felt well cared for because "medication advice" was offered to them, that only 7% considered that their pharmacist could help their compliance, and only 9.6% thought that their pharmacist could help them manage their drug interactions. The online medication file was only offered to a minority of patients and interviews are not common at all.

Concerning medication interviews, it is interesting to compare the results of this work with those of a national survey conducted by Opinion Way from 20 January to 16 February 2017. This survey was of a sample of PLHIV representative of the French population aged over 18 years old who had gone to a pharmacy in the last 2 weeks, and respondents among staff in the pharmacies used by the patients, through an online self-questionnaire.²⁵ In this Opinion Way survey, the medication interview was considered very useful by 31% of the patients, and moderately useful by 35% of them. If remuneration was such as to make this service provision cost-effective, 63% of the pharmacists would be ready to offer it. It seems logical that the involvement of pharmacists in patient care may relate to the costs involved. Pharmacists would like these services to be remunerated. The remuneration, or lack thereof, of pharmacists' clinical activities is the major barrier to the implementation of patient-oriented activities by pharmacists. Thus, the responses to our survey, in which the questions did not mention any remuneration, provide more precise complementary information.

First, the pharmacists' readiness to offer interviews was of the same order (82%) as recommended by the Pharmacy Academy.²⁶ Second, difficulties were brought up concerning not only patient refusal, but also time constraints and the pharmacist's competencies, which would require training provision from the COREVIH, focusing essentially on overall care and on knowledge of care networks. It is noteworthy that people who were most likely to need pharmacists' help, and identified by the latter, were also those who most often wanted medication interviews. They made up 31% of the

survey sample, equivalent to 30-50 000 persons in the whole French population.

It is less surprising that people who had started treatment recently, with less undetectable VL, and anxiety-prone people were especially seeking medication interviews. These situations are well recognized by pharmacists.

Certainly, European recommendations for initial ARV treatment give first place to therapeutic combinations associating two nucleoside/nucleotide analogs and an integrase inhibitor, if possible in one daily tablet. They eschew earlier associations including a third agent, a boosted protease inhibitor, implying a greater number of tablets and of boxes dispensed (and so a risk of less confidentiality), plus an often poor digestive tolerance and a risk of metabolic disorders, in turn increasing cardiovascular risk, and combinations, including a first-generation non-nucleoside reverse transcriptase inhibitor (efavirenz or nevirapine), which were responsible for neuropsychiatric or hepatic complications.²² Also, once a favorable virological outcome is achieved, optimization of the treatment, either to simplify self-administration or to correct and prevent the occurrence of unwanted events, is now acceptable as it is less deleterious and improves quality of life. For patients who have been treated for a longer time, and who may present certain comorbidities, the setting up of medication interviews could be of value if they covered both ARVs and comorbidity treatments (provided required information was available: forgotten prescriptions, inaccessible medical reports, etc), as confirmed by pharmacists' answers concerning the medication file.

5 | CONCLUSION

This study analyzed ARV dispensing with a dual focus on the medication file and the medication interview. Even though health-care systems vary greatly from country to country, it appears to us that this study has clear implications for the clinical improvement of all PLHIV worldwide. Survey findings suggest that better links could be established between PLHIV and the pharmacists completing the care pathway. The high rate of patient acceptance of the medication file (80%)—when the patient was aware it existed—was not anticipated by the pharmacists. Yet pharmacists were aware that a medication interview would be of benefit to those patients who had recently been prescribed ARVs, with a nonstabilized virological status, and who were anxious; such persons accounted for most of the third of patients surveyed who would have accepted the interview. Therefore, pharmacists have an obvious role in patient adherence, and management of comedications. Yet, clinical practice guidelines were described by Tseng.²⁷ However, pharmacists considered that to set up such interviews they first needed training, focused mainly on support and overall care of PLHIV, as their professional activity covers principally patient-oriented services. Pharmacists could be even more important health-care pathway actors. This trend offers a timely instrument to optimize the coordination of care and health practitioners as recently highlighted by Hill.²⁸ However, without

coverage of costs, it is unlikely that the pharmaceutical care for PLHIV in France will change.

ACKNOWLEDGMENTS

Dr Shaya Sable for her proofreading. The other members of the working group of French Society against AIDS (SFLS) for their support: J-Félix Albrecht, Emilie Auffray, Anne Armand, Philippe Arzac, Emmanuelle Boschetti, Laurence Boyer, Pierre Bouttaz, Didier Chedorge, Louis Do, Joëlle Fabien, Agnès Gautheret, Bruno Laurandin, Alexandra Muzard, Isabelle Raymond, Marie-Hélène Tokolo, Sylvia Wehrle Pugniese. The local investigators for their involvement: Christine Faudon, Thierry Allègre, Christine Machou (Aix-en-Provence); Myriam Lombard Jean-Luc Schmit, Céline Peronne (Amiens); Sami Rehaïem, Valérie Rabier, Mareb Bashmilah (Angers); Juliette Gerbe, Virginie Masse, Frédérique Plassart (Argenteuil); Sebastien Trouiller (Aurillac); Estelle Chevalier, Aurelie Proust, Michèle Essert (Besançon); Patricia Honore, Olivier Bouchaud (Bobigny); Mojdham Hessamfar, Didier Neau, Isabelle Raymond, Dominique Breuhl (Bordeaux); Maryse Tissinie, Yves Guimard (Bourges); Jean-Charles Duthe, Luc de Saint Martin, Philippe Lorillon (Brest); Philippe Ferret, Renaud Verdon (Caen), Marie-Hélène Papon-Souris (Chamalières); Isabelle Roussel (Cléon); Mireille Jouannet, Guy Vaganay, Odile Pestre (Clermont-Ferrand); François Cordier (Creil); Feng Zeng, Emmanuel Mortier (Colombes); Patricia Granet (Digne-les-Bains); Sandrine Gothier, Lionel Piroth (Dijon); Cerland Christophe, André Cabié, Marylène Felix (Fort-de-France); Huguette Berthe, Pierre de Truchis, Stéphanie Landowski, Lyna Dehache (Garches); Pascale Leclercq (Grenoble); Laetitia Lainé, Dominique Merrien (La Roche-sur-Yon); Pascale Camps, Mariam Roncato Saberan (La Rochelle); Safia Souak, Alix Greder Belan (Le Chesnay); Claudine Bolliot, OUDA Derradji, Anne-Marie Taburet (Le Kremlin-Bicêtre); Naoul Quatib, Hikombo Hohito, Alexandra Bruel (Le Mans); Hélène Riera (Le Puy-en-Velay); Melanie Goch, Hélène Bazus, Christelle Fournier (Lens); Didier Chedorge (Lyon); Sylvie Tassi, Philippe Simon, Brigitte Loison (Marne-la-Vallée); Sylvie Tassi, Valérie Gregoire Faucher, Saida Bourtoil (Meaux); Patricia Chardon, Nicolas Vignier (Melun); Marie-Argonne Bucher, Céline Robert, Christine (Picard Metz-Thionville); Claude Crisol, Jacques Reynes, Nicolas Terrail (Montpellier); Yolande Rousseau (Moulins); Benedicte Montoya, Vincent Daneluzzi (Nanterre); Eric Billaud, Laurent Flet (Nantes); Sophie Breaud, Pascal Pugniese, Sylvia Werlhen-Pugniese, Laurence Sebban (Nice); Regine Doncesco, Albert Sotto (Nîmes); Patricia Gougeon, Simon Sunder, Victoire Delbee (Niort); Caroline Boulard, Thierry Prazuck, Nathalie Saurel (Orléans); Hervé Trout (Paris-Lariboisière); Leila Issad, Nadia Valin, Anne Dagueneil (Paris Saint-Antoine); Dalila Benkinen, Anne Simon, Marie-Hélène Flevet, Christitne Blanc, Christine Katlama (Paris-Salpêtrière); Sabine Guessant (Paris-Tenon); Bénédicte Montoya, Yves Welcker (Poissy-Saint-Germain); Martine Mallet, Aurelia Eden Hoda Akkari (Perpignan); David Plainchamp, Gwenaëlle Lemoal, Antoine Dupuy (Poitiers); Jean-Charles Duthe, Pascale Perfezou, Jean-Philippe Talarmin, Mélanie Chacou Le Prince (Quimper); Isabelle Kmiec, Firouze Bani Sadr, Philippe Benoit (Reims); Charlotte Cameli, Cédric Arvieux, Isabelle Cardiet (Rennes); Guillemette Unal, Manuel Etienne

(Rouen); Jean-Charles Duthe, Corine Daniel, Eleonore Legris (Saint-Brieuc), Martine Florentino (Saint-Eloy les-Mines); Veronique Ronat, Anne Frésard (Saint-Etienne); Marie-Christine Duronea, Patrice Poubeau, Françoise Chan (Saint-Pierre); Véronique Walter, Cyril Clavel (Saint-Martin); Dominique Bornarel, David Zucman, Aurélie Chan Hew Wai, Bruno Laurandin (Suresnes); Véronique Lambry, Gisèle Philippe, Alain Lafeillade, Odile Le Noel (Toulon Paulien Cornavin, Bertrand Riff, Véronique Dubar Tourcoing, Lydie Fevre, Simona Pavel, Florence Daniau Troyes Emilie Racamier, Hélène Champagne, Claire Combe (Valence); Mikael Delestan, Thierry May, Emmanuelle Boschetti (Vandoeuvre-les-Nancy); Florence Gourdon (Vichy); and all the pharmacies that replied anonymously to the online survey. These data have been submitted and accepted as a poster presentation at 18th JN1 in Saint Malo (France) and an article has been accepted by "Journal de Pharmacie Clinique", a non-referenced French journal for pharmacists' training.

CONFLICT OF INTEREST

None declared.

AUTHORS' CONTRIBUTIONS

All authors were involved in the study design, data interpretation, reviewed the results, and approved the final manuscript. C.J, JL, and AC supervised the study conduct. DC was responsible for the study conduct. CL supervised the statistical analyses. CJ produced the final version of the manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Christine Jacomet  <https://orcid.org/0000-0003-0794-6934>
 Julie Langlois  <https://orcid.org/0000-0001-8259-9659>
 Solene Secher  <https://orcid.org/0000-0002-0404-8277>
 Dilek Coban  <https://orcid.org/0000-0003-4598-3664>
 Celine Lambert  <https://orcid.org/0000-0002-6459-4800>
 David Zucman  <https://orcid.org/0000-0002-7682-0115>
 Eric Billaud  <https://orcid.org/0000-0002-3420-1228>
 Agnes Certain  <https://orcid.org/0000-0002-0851-1716>

REFERENCES

1. Under the direction of Pr Morlat P. and on the aegis of CNS and ANRS. Prise en charge des personnes vivant avec le VIH. https://cns.sante.fr/wp-content/uploads/2017/10/experts-vih_epidemiopdf, accessed April 24, 2020.
2. Cohen MS, Chen YQ, McCauley M, et al. Antiretroviral Therapy for the prevention of HIV-1 transmission. *N Engl J Med*. 2016;375(9):830-839. <https://doi.org/10.1056/NEJMoa1600693>
3. Lundgren JD, Babiker AG, Gordin F, et al. INSIGHT START Study Group. Initiation of antiretroviral therapy in early asymptomatic HIV infection. *Engl J Med* 2015; 373(9):795-807. [10.1056/NEJMoa1506816](https://doi.org/10.1056/NEJMoa1506816).
4. Jacomet C, Cormerais L, Peyrol F, et al. Parcours de soins des personnes vivant avec le VIH et suivies à l'hôpital en 2012. *Bull Epidemiol Hebd*. 2014;24-25:422-428.

5. Under the direction of Pr Morlat P. and on the aegis of CNS and ANRS. Prise en charge des personnes vivant avec le VIH. https://cns.sante.fr/wp-content/uploads/2019/08/experts-vih_comorbidites.pdf, accessed April 24, 2020.
6. Marzolini C, Elzi L, Gibbons S, et al. Swiss HIV Cohort Study. Prevalence of comedications and effect of potential drug-drug interactions in the Swiss HIV Cohort Study. *Antivir Ther.* 2010;15(3):413-423. <https://doi.org/10.3851/IMP1540>
7. Jacomet C, Berland P, Guiguet M, et al. Impact of age on care pathways of people living with HIV follow-up in hospital. *AIDS Care.* 2017;29(1):105-111.
8. LOI n° 2016-41 du 26 janvier 2016 de modernisation de notre système de santé. Rassembler les acteurs de santé autour d'une stratégie partagée. Journal officiel de la République Française No. 0022 27 January 2016. <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031912641&dateTexte=&categorieLien=id>, accessed April 24, 2020
9. Ministry of Social Affairs and Health. Ordinance of June 23, 2013 concerning the approval of the amendment N°1 to the national convention of April 4, 2012 organizing the relations between the pharmacists holding pharmacies and the health insurance relating to the accompaniment of the chronic patients under oral anticoagulants. <http://www.ameli.fr/professionnels-de-sante/pharmaciens/votre-convention/convention-nationale-titulaires-d-officine/avenant-n-1-a-la-convention-nationale.php> accessed April 24, 2020.
10. Delaugerre C, Ghosn J, Lacombe J-M, et al. FHDH-ANRS CO4. Significant reduction in HIV virologic failure during a 15-year period in a setting with free healthcare access. *Clin Infect Dis.* 2015;60(3):463-472. <https://doi.org/10.1093/cid/ciu834>
11. Holtzman C, Armon C, Tedaldi E, et al. Polypharmacy and Risk of Antiretroviral Drug Interactions Among the Aging HIV-Infected Population. *J Gen Intern Med.* 2013;28(10):1302-1310.
12. Dray-Spira RM, Wilson d'Almeida K, Aubrière C, et al. Health status of people living with HIV followed at hospital in metropolitan France in 2011 and characteristics of those recently diagnosed. Results of the ANRS-VESPA2 Study. *Bull Epidemiol Hebd.* 2013;26-27, 285-92.
13. Gimeno-Gracia M, Crusells-Canales MJ, Armesto-Gómez FJ, et al. Polypharmacy in older adults with human immunodeficiency virus infection compared with the general population. *Clin Interv Aging.* 2016;11:1149-1157. <https://doi.org/10.2147/CIA.S108072>
14. Cantudo-Cuenca MR, Jiménez-Galán R, Almeida-González CV, et al. Concurrent use of comedications reduces adherence to antiretroviral therapy among HIV-infected patients. *J Manag Care Spec Pharm.* 2014;20(8):844-850.
15. Horberg MA, Hurley LB, Silverberg MJ, Kinsman CJ, Quesenberry CP. Effect of clinical pharmacy services and specialty services for patient with HIV infection. *Am J Health Syst Pharma.* 2016;73(11):757-763.
16. Cocohoba J, Murphy P, Pietrandoni G, Guglielmo J. Improved antiretroviral refill adherence in HIV-focused community pharmacies. *J Am Pharm Assoc.* 2003;52(5):e67-e73.
17. Colgan K, Beacher R. Importance of specialty pharmacy to your health system. *Am J Health Syst Pharm.* 2015;72(9):753-756.
18. Herrero N. Apport des pharmaciens d'officine et des biologistes de laboratoire dans l'application des directives concernant la prévention, le dépistage et le suivi des personnes infectées par le VIH, du plan VIH-SIDA 2010-2014, en Auvergne. Paris V University: Thesis in Pharmacy; 2014.
19. Guillerrou A. Etude sur les traitements antirétroviraux en dispensation à la pharmacie hospitalière de Rennes. Thesis in Pharmacy. Rennes University; 2016.
20. Cazein F, Le Strat Y, Sarr A, et al. Dépistage de l'infection par le VIH en France, 2003-2015. *Bull Epidemiol Hebd.* 2016;41-42:745-748.
21. Capsec J, Brand D, Chaillon A, et al. Caractéristiques des infections VIH très récentes et réseaux de transmission à partir des données de la déclaration obligatoire, France 2012-2014. *Bull Epidemiol Hebd.* 2016;41-42:755-762.
22. Under the direction of Pr Philippe Morlat and under aegis of CNS and ANRS. Prise en charge médicale des personnes vivant avec le VIH. Recommandations du groupe d'experts. Janvier 2017 <http://cns.sante.fr/actualites/prise-en-charge-du-vih-recommandations-du-groupe-dexperts/> accessed April 24, 2020.
23. Gilbert E, Gerzenstein L. Integration of outpatient infections disease clinic pharmacy services and specialty pharmacy services for patients with HIV infection. *Am J Health Syst Pharm.* 2016;73(11):757-763.
24. Barnes E, Zhao J, Giumenta A, Johnson M. The effect of an integrated health system specialty pharmacy on HIV antiretroviral therapy adherence, viral suppression, and CD4 count in an outpatient infectious disease clinic. *J Manag Care Spec Pharm.* 2020;26(2):95-102.
25. Pavie X. satispharma et Opinion way. Entre les attentes et le ressenti des pharmaciens: Avenir Pharmacie. Une photographie unique sur la pharmacie de demain. 2017. <http://www.pharmagoraplus.com/avenir-pharmacie-2017> accessed April 24, 2020.
26. Rapport de l'académie nationale de Pharmacie. (2015). Observance des traitements médicamenteux en France. Académie nationale de Pharmacie; URL: https://www.acadpharm.org/dos_public/Rapport_l_observance_medicamenteuse_VF_CORR_DGS_2016.02.09.pdf accessed April 24, 2020.
27. Tseng A, Foisy M, Kelly D, et al. Role of the pharmacist in caring for patients with HIV/AIDS: Clinical practice guidelines. *Can J Hosp Pharm.* 2012;65:125-145.
28. Hill LA, Ballard C, Cachay ER. The role of the clinical pharmacist in the management of people living with HIV in the modern antiretroviral era. *AIDS Reviews.* 2019;21(4):195-210.

How to cite this article: Jacomet C, Langlois J, Secher S, et al. Pharmacist's role in HIV care in France. Implication for clinical improvement of people living with HIV worldwide. *Pharmacol Res Perspect.* 2020;e00629. [https://doi.org/10.1002/prp2.\\$AID\\$](https://doi.org/10.1002/prp2.AID)