International Journal of Nursing and Health Care Research

OPEN ACCESS

Etienne G, et al. Int J Nurs Health Care Res 8: 1633

www.doi.org/10.29011/2688-9501.101633

www.gavinpublishers.com

GAVIN PUBLISHERS

Research Article

Feasibility of a Remote Follow-up: A Pilot Study for the Future Care Plan of Chronic Myeloid Leukemia Patients

Gabriel Etienne[1,3,4], Emilie Klein[2,3], Fanny Robbesyn[2,3], Carole Faberes[1], Claudine Chollet[2,3], Valérie Lapeyre[1], Catherine M. Sawai[2,3], Anna Schmitt[1], Remi Devos[2,3], Fontanet Bijou[1], François-Xavier Mahon[1,3,4], Stéphanie Dulucq[2,3,4*]

[1]Département d'Hématologie, Institut Bergonié, Bordeaux, France

[2]Laboratoire d'Hématologie, Hospital Haut Lévêque Centre Hospitalier Universitaire de Bordeaux, Pessac, France

[3]Bordeaux Institute in Oncology-BRIC-MoTRIL team, INSERM U1312, Université. Bordeaux, Bordeaux, France

[4]Groupe France Intergroupe des Leucémies Myéloïdes Chroniques, FiLMC, Centre Léon Bérard,Lyon, France

[*]**Corresponding author**: Stéphanie Dulucq, Laboratory of Hematology, Bordeaux University Hospital, Avenue de Magellan, 33604 Pessac Cedex, France

Citation: Etienne G, Klein E, Robbesyn F, Faberes C, Chollet C, et al. (2025) Feasibility of a Remote Follow-up: A Pilot Study for the Future Care Plan of Chronic Myeloid Leukemia Patients. Int J Nurs Health Care Res 8:1633. DOI: https://doi.org/10.29011/2688-9501.101633

Received Date: 01 April, 2025; **Accepted Date:** 08 April, 2025; **Published Date**: 12 April, 2025

Abstract

Aim: To evaluate the feasibility of a remote follow-up in chronic phase chronic myeloid leukemia patients. **Patients and Methods:** Remote follow-up was based on kits that enable the shipment of blood samples obtained either at neighbourhood laboratory or at the patients' domicile by a nurse and sent by mail to the regional laboratory for the assessment of BCR::ABL1/ABL1IS ratio followed by a phone or video consultation. Following the first consultation and in order to obtain patients' feedback a questionnaire was sent to the patients. **Results:** From March 2020 to December 2021, 224 BCR::ABL1IS assessments were performed in 144 patients. Three out of the 224 blood collection samples failed the *BCR::ABL1*^{IS} quantification. We observed that a delivery time longer than 4 days led to a significant decrease in the ABL1 copy number per replicate. Overall and based on the 137 completed and returned questionnaires, 80% of the patients highly or somewhat prefer this remote follow-up and agreed to use it under normal circumstances, i.e. free from COVID-19 related restrictions. **Conclusion:** Our study demonstrates that a remote biological and clinical follow-up is feasible and well received among patients and should be taken into account for the future care plan and recommendations.

Citation: Etienne G, Klein E, Robbesyn F, Faberes C, Chollet C, et al. (2025) Feasibility of a Remote Follow-up: A Pilot Study for the Future Care Plan of Chronic Myeloid Leukemia Patients. Int J Nurs Health Care Res 8:1633. DOI: https://doi.org/10.29011/2688-9501.101633

Keywords: CML; Remote Follow-up; Teleconsultation; Healthcare

Introduction

Tyrosine Kinase Inhibitors (TKI) have dramatically improved the prognosis of chronic myeloid leukemia (CML) with an expected life expectancy close to the healthy population in newly diagnosed chronic phase CML (CP-CML) patients [1]. While progression-free survival was the main therapeutic objective of the past two decades, recent recommendations in the field have evolved and quality of life without life-long TKI exposure should be considered [2]. Indeed, numerous clinical trials have now demonstrated that a substantial proportion of patients who have achieved a deep and sustained molecular response can safely discontinue their treatment without molecular relapse defined as major molecular loss [3,4]. Then prolonged treatment exposure associated with the risk of late and sometimes serious adverse events (AE) together with a negative impact on patients' quality of life can be avoided [5,6]. However, based on recent reports of late molecular relapse, a sustained molecular follow-up after TKI cessation is required [7,8]. Patients must go to their regional specialist medical centre, which is linked to the reference regional laboratory, to consult their doctor and monitor their residual disease. The frequency of follow-up depends on the treatment phase, but varies from every month to every 3 or 6 months. In order to maintain and facilitate this follow-up on a long term basis, we evaluate the feasibility of a remote follow-up based on kits that enable the shipment of blood samples obtained either at the patients' domicile or neighbourhood laboratory and send by mail to the reference laboratory that carries out the assessment of *BCR::ABL1/ABL1*^{IS} ratio and phone or video consultation was performed as soon as the *BCR::ABL1*^{IS} result was available. Following the first remote consultation and in order to obtain patients' feedback a questionnaire was sent to the patients. This study was initially designed for patients who have discontinued TKI treatment in a treatment-free remission (TFR) strategy. Taking into account the rising prevalence of the disease, we decided to extend the study to patients treated with TKI. Here we report a preliminary analysis based on an interim analysis of 224 *BCR::ABL1*^{IS} assessments performed in 144 patients over a 21 months period.

Methods

Patients

From March 2020 to December 2021, we included adult patients (≥18 years old), diagnosed in CP-CML. All patients have been informed and have not expressed their opposition to be included in this observational study according to the current French regulations.

Process

Blood samples were collected on 2 ethylenediaminetetraacetic acid **(EDTA)** blood collection tubes (2*4.5ml) supplied in the kit, at neighbourhood laboratory or patients' domicile (private home) by the nurse and sent to the reference laboratory with a special mail service using triple packaging required for the transport of organic products. The shipments occurred at ambient temperature with priority mailing. Several kits at different time points of the follow-up could be used in the same patient. *BCR::ABL1/ABL1*^{IS} ratio was assessed by reverse transcription quantitative polymerase chain reaction (RT-qPCR) after RNA extraction and reported as ratios of *BCR::ABL1* to *ABL1* standardized to the international scale (IS) (*BCR::ABL1/ABL1*^{IS}) according to previously reported recommendations [8,9]. Three and 2 replicates were performed for *BCR::ABL1* and *ABL1* genes respectively. A 3 (MR3 or Major Molecular Response, MMR), 4 (MR4) and 4.5 log (MR4.5) molecular responses were defined as a 3-log, 4-log or 4.5-log-reduction of transcript, equivalent to *BCR::ABL1*^{IS} ≤0.1%, ≤0.01% or ≤0.0032% respectively.

The quality of RNA was evaluated by control gene mean copy number per PCR replicate, i.e. *ABL1* gene, and mean number of *ABL1* copies per replicate of each sample with a minimum quality criteria of *ABL1* ≥ 10000 copies per replicate currently recommended [9,10].

In order to evaluate a potential impact of the delivery time on the quality of RNA, the mean number of *ABL1* copies per replicate of each sample was analysed taking into account the time between the date of blood collection to the date of the receipt at the reference laboratory (delivery time).

We also compared for each patient, the difference between the mean of the three previous *ABL1* copy numbers per replicate obtained before this remote follow-up and the *ABL1* copy number obtained in the study. Differences were analysed according to the delivery time.

As soon as *BCR::ABL1*^{IS} result was available, a phone or video consultation according to patient preference was performed. At the end of this remote consultation, medical documents, i.e. medical prescriptions, blood analyses results including BCR::ABL1IS result were generated, archived in patient medical record and if possible shared with the patient using a French software application (Panda lab) [11]. Date and type of the next consultation- remote or at medical center-were established according to patient and physician decisions. If necessary and according to the physician's point of view, a prompt consultation at the medical center was planned following the video or phone consultation.

To evaluate patients' feedback on this remote follow-up and to collect specific socio-demographic informations, a questionnaire was sent to the patients following the first video or phone consultation (details of the questionnaire are available in the supplementary appendix).

Statistical Analyses

Socio-demographic variables (Sex, age, employed or retired, internet access and frequency of use, cell phone possession, distance between the medical center and home) and CML patient characteristics (time from CML diagnostic to first remote blood collection sample, molecular response levels and treatment discontinuation phase or TKI treatment at the time of the remote blood analysis) were compared with the level of perception of the video or telephone consultation coupled with sending biologic specimens by mail according to the answer to the question C1 of the questionnaire. Levels of perception were pooled into 3 sub-groups: highly prefer and somewhat prefer **(group 1**), somewhat dislike and very much dislike (group 2) and patients with no preference or no answer (group 3). Socio-demographic variables were compared between the three groups.

All variables were assessed by univariate analysis using Fisher test or T tests. P-value ≤ 0.05 was considered as significant. Age at the date of questionnaire was categorized into 2 groups, with cut-off set at the median. Correlation between *ABL1* mean copy number and the delivery time was estimated by calculation of the correlation coefficient R2. Analyses were performed with the SPSS v22 software.

Results

Patients

From March 2020 to December 2021, 144 patients agreed to participate to this remote follow-up. The characteristics of the study population are presented in Table 1. Median age at diagnosis and at the first point of the remote follow-up were 56 and 67 years respectively and 41% were female. At the time of the first blood sample collection, 39 (27.1%) patients were free from TKI in the context of a TFR program with a median time between TKI discontinuation and first remote *BCR::ABL1*^{IS} analysis of 4.2 years (range 0.1-12.5).

Variables	N=144
Median age at diagnosis, years (range)	55.9 (18.9-85.6)
Sex, Female, n (%)	49 (41.0)
Median age at first remote *BCR::ABL1/ABL1*^{IS}, years (range)	67.5 (21.3-97.7)
Median time from diagnosis to first remote blood collection sample, years (range)	10.6 (0.8-26.8)
TFR at first remote *BCR::ABL1/ABL1*^{IS}, n (%)	39 (27.1)
Median BCR::ABL1/ABL1^{IS} (range)	0.0014 (0 – 17.3)*
BCR::ABL1/ABL1^{IS} ≤0.0032%, n pts (%)	92 (64.8)*
Abbreviations: TFR: Treatment-Free Remission; *Based on 221 available assessments	

Table 1: characteristics of the study population at the time of the first remote *BCR::ABL1/ABL1*^{IS} assessment (n=144 patients).

Among the 105 remaining patients, 54 (37.5%) were on first line TKI and 51(35.4%) were on second or further TKI lines with a median time from first-line or last TKI start to the date of the *BCR::ABL1*^{IS}analysis of 5.6 years (range: 0.7-20.4) and 4.9 years (range: 0.2-14.6) respectively. Overall, 92 (64.8%) were in MR4.5 and 9 (6.2%) were not in MMR with a *BCR::ABL1*^{IS}higher than 0.1%. The remaining 43 (29.9%) patients were in MMR or MR4 with a *BCR::ABL1*^{IS}rising from 0.0032% to 0.1%.

Blood Samples Collections

Over a 21-month period, 224 *BCR::ABL1*^{IS}were performed in 144 patients using postal kits (one assessment in 87 patients, 2 in 45 patients, 3 in 6 patients, 4 in 2 patients, 5 in 3 patients and 6 in one patient). Six patients have at least 4 *BCR::ABL1*^{IS}. Among them, 5 patients underwent *BCR::ABL1*^{IS}monthly evaluation following TKI cessation in a TFR program. Blood samples were obtained at patient domicile or neighbourhood laboratory or both in 36 (25%) patients, 100 (73%) patients and 6 (4.1%) patients respectively.

Quality of RNA

Patient samples arrived at the reference laboratory between 1 and 9 days (median time: 2 days) *BCR::ABL1/ABL1*^{IS}quantification failed in 3 out the 224 blood collection samples due to a *ABL1* copy number per replicate lower than 10000. This poor RNA quality for these 3 samples was due to either an inadequate pre-analytic process (n=2) or a lengthy shipment (9 days for one). Theses 3 patients were contacted and performed another remote blood collection. RNA quality was correlated with the delivery time (R2=0.9326). Thus, the longer the delivery time was, the mean ABL1 copy number per replicate is low (Figure 1-A).

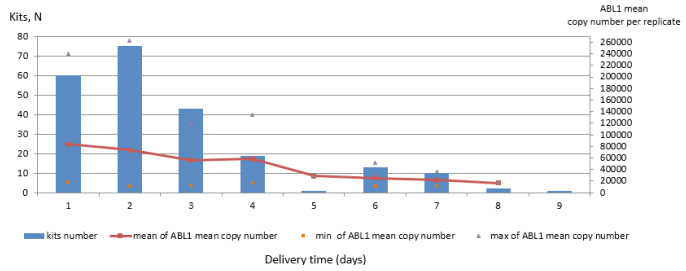

Figure 1A: Number of remote blood samples (kits) analyses according to the shipment duration and copy number of the control gene *ABL1* obtained (n=224remote blood samples).

We observed that a delivery time longer than 4 days led to a significant decrease in the *ABL1* copy number per replicate. The impact of the delivery time was also confirmed when difference between the copy number of *ABL1* obtained during the remote follow-up and the mean of the 3 last *ABL1* copy number per replicate previously obtained for each patient was analysed (Figure 1-B). Patients were then recommended to perform blood collection samples only at the beginning of a given week.

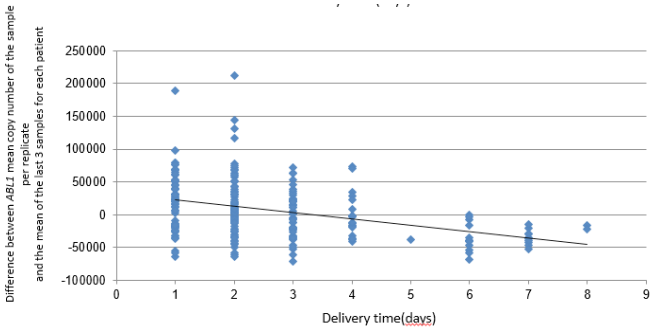

Figure 1B: Difference between the mean of the 3 *ABL1* copy numbers previously obtained and the result of the remote analysis for each patient (n=144) according to the delivery time.

Consultations at Medical Center Following Video or Phone Consultations

Following video or phone consultation, a consultation at the medical center was planned in 12/144 patients according to physician decision. Half of these consultations were related to CML management (TKI related AE in 3 patients; TKI resumption after molecular relapse in 3 patients in TFR). The remaining were not related to CML management (worsening of a pre-existing comorbidity in 3 patients, new occurring diseases in 3 patients, all CML and TKI-unrelated).

Patient Sociodemographic Characteristics and Perception of the Remote Follow-Up

Following the first video or phone consultation depending on patient preference, a questionnaire aiming to collect several socio-demographic data and perception of this remote follow-up was sent to the patients. A total of 137 questionnaires were completed and returned. The socio-demographic data of the 137 patients are presented in Table S1. The median age at the date of completed questionnaire was 67 years and 58% of the patients were retired. Eighty-six % of the patients have internet access but only 65% are regular user. Almost all the patients (97%) have a cell phone and 57% were able to download and use applications with the cell phone.

Variables	N=137
Median age at the date of the questionnaire, years (range)	67 (21-91)
Sex, Female, n (%)	56 (40.9)
Median distance between patients' domicile and medical center, km(range)	68 (2.3-867)
Current status employed / unemployed / retired, n (%)	51 (37.2) / 6 (4.4) / 80 (58.4)
Internet access, Yes / No, n (%)	118 (86.1) / 19 (13.9)
Regularly use the internet, Yes / No, n (%)	89 (64.9) / 48 (35.0)
Have cell phone, Yes / No, n (%)	133 (97) / 4 (2.9)
Use cell phone to access the internet, Yes / No, n (%)	87 (63.5) / 50 (36.5)
Use cell phone to download and use applications, Yes; / No, n (%)	79 (57.6) / 58 (42.3)

Table S1: Socio-demographic characteristics of the patients who fulfilled and returned the questionnaire (n=137 patients).

Regarding patients' perception of the advantages of a video or telephone consultation, gain in time and easy organization were the most frequently cited advantages in this multiple response possible question (Figure 2-A). Unsurprisingly, lack of physical examination was the most frequently cited drawback following by difficulties to communicate and to exchange document(s) with the physician (Figure 2-B).

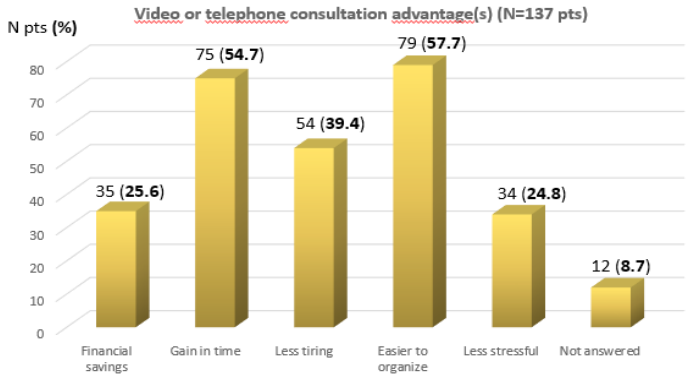

Figure 2A: patient perception of the advantage(s). [Pts: patients].

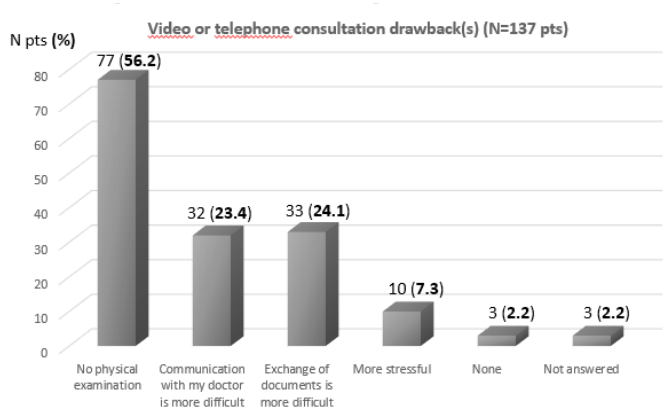

Figure 2B: The drawback(s). [Pts: patients].

In spite of these reported drawbacks, 80% of the patients were satisfied or very satisfied with these remote consultations (Figure 2-C). Overall, 80% of the patients highly or somewhat prefer this remote follow-up and agreed to use it under normal circumstances, i.e. free from COVID-19 related restrictions (Figure 2-D).

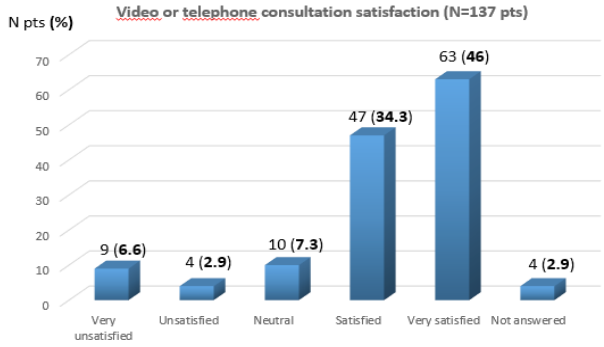

Figure 2C: Video or phone consultation (multiple response possible questions), patient global satisfaction of the video or telephone consultation. [Pts: patients].

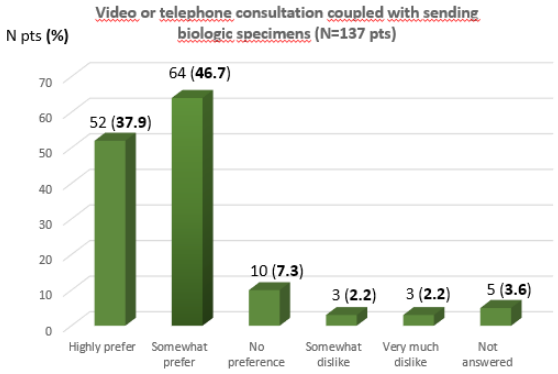

Figure 2D: Patient opinion regarding follow-up based on the shipment of local blood samples and video or telephone consultation. [Pts: patients].

In addition, patient preference concerning video or telephone consultation, patient perception of the role of a specialized nurse in the care and follow-up and the wish to receiving validated *BCR::ABL1*^{IS}results have been evaluated (Figure 3, supplementary appendix). Of note, only 36% of the patients were favourable to the delegation of their care and follow-up to a specialized nurse (Figure 3-B, supplementary appendix).

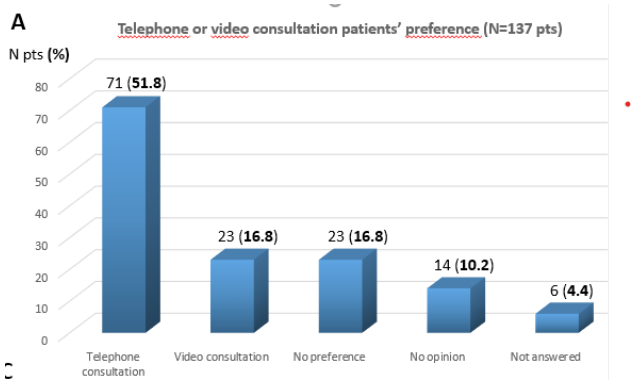

Figure 3A: Patient preference of a video or telephone consultation.

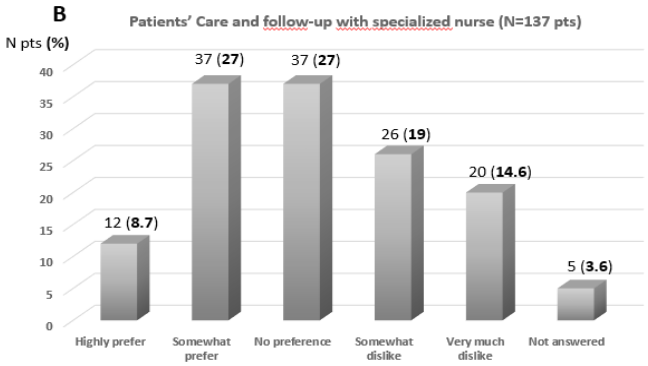

Figure 3B: Patient opinion regarding the role of a specialized nurse in the care and follow-up.

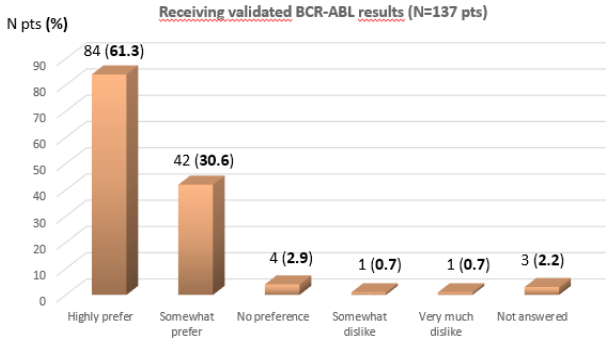

Figure 3C: Patient attempt to receiving validated BCR::ABL1/ABL1IS results.

Factors Associated to the Patients' Level of Satisfaction of the Remote Follow-Up and Care

Three groups of patients were defined according to the answer to the question C1 of the questionnaire: highly prefer and somewhat prefer (group 1, n=116), somewhat dislike and very much dislike (group 2, n=6) and patients with no preference or no answer (group3, n=15). We failed to identify any factor associated with patients satisfaction level except *BCR::ABL1*^{IS} (Table 2).

Variables	N=137
Median age at the date of the questionnaire, years (range)	67 (21-91)
Sex, Female, n (%)	56 (40.9)
Median distance between patients' domicile and medical center, km(range)	68 (2.3-867)
Current status employed / unemployed / retired, n (%)	51 (37.2) / 6 (4.4) / 80 (58.4)
Internet access, Yes / No, n (%)	118 (86.1) / 19 (13.9)
Regularly use the internet, Yes / No, n (%)	89 (64.9) / 48 (35.0)
Have cell phone, Yes / No, n (%)	133 (97) / 4 (2.9)
Use cell phone to access the internet, Yes / No, n (%)	87 (63.5) / 50 (36.5)
Use cell phone to download and use applications, Yes; / No, n (%)	79 (57.6) / 58 (42.3)

Table 2: Socio-demographic characteristics of the patients who fulfilled and returned the questionnaire (n=137patients).

Patients who somewhat dislike or very much dislike the remote follow-up had higher levels of *BCR::ABL1*^{IS}transcript (p=0.014) while being free from TKI or not at that time did not significantly influenced patients' opinion (p=0.495). Patients 67 years and older at the date of filling out the questionnaire were less frequent regular internet users (45.1% vs 86.4%, p<0.001) but regular use of the internet did not influence the level of satisfaction. Among regular internet user patients, 94.2% patients highly prefer or somewhat prefer the remote follow-up vs 96.3% of the patients who were not (p=0.577). Furthermore, among patients 67 years and older only 7.3% somewhat dislike or very much dislike the remote follow-up against 3% among patients 67 years and younger at the date of questionnaire (p=0.251).

Discussion

Management of CML patients is based on regular assessments of *BCR::ABL1*^{IS}transcript level performed according to recommendations [9,10]. Taken into account the expected rising prevalence of the disease together with the requirement of this long-life follow-up, we have evaluate the feasibility of a remote follow-up based on local blood samples dispatched to a centralized reference laboratory followed by video or phone consultation.

Based on this interim analysis, we demonstrated that the first step of this remote follow-up, i.e. local blood samples delivered to the reference laboratory using specific mail, is reliable provided that blood samples delivery time does not exceed 4 days. Maintaining centralized molecular follow-up has several advantages. First, from the physician's point of view, the management of TKI therapy including discontinuation has to take into account the patient molecular follow-up from diagnosis to the last available assessment which is easier when all the data are available on a single report. Indeed, duration of deep molecular response together with TKI duration are the main selection patient criteria in the objective of a TKI discontinuation in a TFR program [2,12,13]. This also enables patients to be monitored on a personalized basis through clinical-biological cooperation. Finally, this centralized molecular follow-up allows the possibility to preserve biological materials for additional biological tests such as BCR::ABL1 domain kinase mutation analysis in case of TKI failure.

The second step of this remote follow-up was based on a video or telephone consultation according to patients' preference. Despite high patient global satisfaction, 80% of the patients were satisfied or very satisfied about the process, the main reported drawbacks were the absence of physical examination and the difficulties to exchange or to share medical documents with the physician. Concerning the first point, we have to keep in mind that nearly 3 out of 4 patients diagnosed in CP-CML do not have at diagnosis any symptoms related to the disease and further symptoms may be TKI-related rather than CML-related.

Then, the management of CML patients on a life-long basis must take into account both, the efficacy and safety of TKI. With a hindsight of more than 10 years of the third generation TKI use, TKI safety profiles are now well-established [5]. We now know that most of the TKI-related adverse events occur early in the course of therapy, are dose-related and for some of these, can be predictable according to age and pre-existing comorbidities. However, several serious AE may occur later in the course of TKI therapy, i.e. vascular occlusive arterial events reported with nilotinib and ponatinib, pleural effusion with dasatinib and gastro-intestinal AE with bosutinib [14-16]. Then clinical regular evaluation must be planned in order to prevent, detect and if necessary care these events. Whether this monitoring can be performed, using remote consultation remains to be determined.

In spite of the fact that this study was performed in patients with a long disease history and for some of them in prolonged TFR, this interim analysis demonstrates that remote follow-up is feasible and well accepted by patients. Whether remote follow-up can be partially delegate to a nurse practitioner in the perspective of a continuous increasing of CML prevalence and a stable medical demography remains a relevant issue. In this study, only 36% of the patients were favourable to this partial delegation. This may be explained in part by the characteristics of the study population with a median time from diagnosis to the first point of the remote follow-up of more than 10 years without any previous nurse practitioner intervention.

Concerning the second point, i.e. the reported difficulties to exchange or share medical documents with the physician, we used a software application to share medical documents with patients following video or phone consultation. Nevertheless, 35% of the patients declared that they were not internet regular users. However, this statement was not significantly associated with an unfavourable feedback of the remote follow-up.

This study has some limitations. First, the study started at the beginning of the COVID-19 pandemic and we hypothesized that COVID-19 related restrictions might have a positive impact on patients' perception. However, we did not find any difference in patient satisfaction according to the date of the questionnaire completion and the COVID-19 vaccination status of the patients (data not shown).

Second, the study population is not fully representative of all CML patients as most of the patients were in sustained deep and stable molecular response and a long disease history. However, we are currently evaluating whether this remote follow-up could be planned earlier in the course of the disease in a larger cohort of patients.

Third, we did not assess if a remote follow-up has a negative impact on patients' adherence to TKI but we did not observe unexpected *BCR::ABL1*^{IS}increase except in one patient who harbored previous similar *BCR::ABL1*^{IS}increases related to a recognized poor adherence to treatment. Nevertheless, we are aware that this efficient remote follow-up that has proved successful and well supported by patients, could be adapted to other countries according to different health care systems and patient population profiles.

Conclusion

Our study demonstrates that a remote biological and clinical follow-up is feasible and well received among patients and should be taken into account for the future care plan and recommendations.

Acknowledgments

We thank all the CML patients who accepted to participate in this first remote pilot study and completed the questionnaire. We are grateful for Institut Bergonié and Centre Hospitalier Universitaire de Bordeaux for supporting the study. We thank Mr David Karle, Director of the biology and pathology department at the Saint Andre hospital group (at the time the project was set up) and Mrs Catherine Franco, Transport Referent, new hospital and operational resources department, for their valuable help in setting up the project. We also thank Mr Sebastien Terrade, Responsible for the logistic sectors, for help in pursuing the project.

Authorship

GE and SE designed the study. GE, AS, FB and FXM enrolled patients in the study. FR, VL and CF collected the clinical and biological data. EK, SD, CC, RD performed the molecular follow-up. SD and GE wrote the article. CS checked the English and provided suggestions All authors have proof read the manuscript and agree in its content.

Author's Disclosure Statements

GE is a consultant for Novartis, Bristol Myers Squibb, Pfizer and Incyte Pharma and has given some lectures for Bristol Myers Squibb, Incyte Pharma, Pfizer and Novartis. He has received research grants from Novartis and Bristoll Myers Squibb.

EK, FR, CF, CC, VL, CS, RD, AS, FB and FXM have nothing to disclose.

SD has given some lectures for Novartis and Incyte Pharma.

Conflicts of Interest

The authors declare no conflicts of interest for the current work.

Funding Statement

No funding was provided for this study.

Patient Consent Statement

Written informed consent was obtained from all patients.

References

1. Bower H, Björkholm M, Dickman PW, Höglund M, Lambert PC, et al. (2016) Life Expectancy of Patients With Chronic Myeloid Leukemia Approaches the Life Expectancy of the General Population. J Clin Oncol 34: 2851-2857.
2. Hochhaus A, Baccarani M, Silver RT, Schiffer C, Apperley JF, et al. (2020) European LeukemiaNet 2020 recommendations for treating chronic myeloid leukemia. Leukemia. 34: 966-984.
3. Dulucq S, Astrugue C, Etienne G, Mahon FX, Benard A (2020) Risk of molecular recurrence after tyrosine kinase inhibitor discontinuation in chronic myeloid leukaemia patients: a systematic review of literature with a meta-analysis of studies over the last ten years. Br J Haematol 189:452-468.
4. Rousselot P, Charbonnier A, Cony-Makhoul P, Agape P, Nicolini FE, et al. (2014) Loss of major molecular response as a trigger for restarting tyrosine kinase inhibitor therapy in patients with chronic-phase chronic myelogenous leukemia who have stopped imatinib after durable undetectable disease. J Clin Oncol 32: 424-430.
5. Steegmann JL, Baccarani M, Breccia M, Casado LF, García-Gutiérrez V, et al. (2016) European LeukemiaNet recommendations for the management and avoidance of adverse events of treatment in chronic myeloid leukaemia. Leukemia. 30:1648-1671.
6. Efficace F, Vignetti M, Sparano F, Scalzulli E, Breccia M (2021) Optimizing health-related quality of life in patients with chronic myeloid leukemia treated with tyrosine kinase inhibitors. Expert Rev Hematol 14: 293-302.
7. Rousselot P, Loiseau C, Delord M, Cayuela JM, Spentchian M (2020) Late molecular recurrences in patients with chronic myeloid leukemia experiencing treatment-free remission. Blood. 24:3034-3040.
8. Dulucq S, Nicolini FE, Rea D, Cony-Makhoul P, Charbonnier A, et al. (2022) Kinetics of early and late molecular recurrences after first-line imatinib cessation in chronic myeloid leukemia: updated results from the STIM2 trial. Haematologica. 107: 2859-2869.
9. Cross NCP, White HE, Müller MC, Saglio G, Hochhaus A (2012) Standardized definitions of molecular response in chronic myeloid leukemia. Leukemia. 26: 2172-2175.
10. Cross NCP, White HE, Colomer D, Ehrencrona H, Foroni L, et al. (2015) Laboratory recommendations for scoring deep molecular responses following treatment for chronic myeloid leukemia. Leukemia. 29: 999-1003.
11. PandaLab. PandaLab | La messagerie médicale au coeur de votre pratique. n.d. Available from: https://www.pandalab.fr [Last accessed: 5/23/2022].
12. Rea D, Ame S, Berger M, Cayuela JM, Charbonnier A, et al. (2018) Discontinuation of tyrosine kinase inhibitors in chronic myeloid leukemia: Recommendations for clinical practice from the French Chronic Myeloid Leukemia Study Group. Cancer. 124: 2956-2963.
13. Deininger MW, Shah NP, Altman JK, Berman E, Bhatia R, et al. (2020) Chronic Myeloid Leukemia, Version 2.2021, NCCN Clinical Practice Guidelines in Oncology. J Natl Compr Cancer Netw 18:1385-1415.

14. Kantarjian HM, Hughes TP, Larson RA, Kim DW, Issaragrisil S, et al. (2021) Long-term outcomes with frontline nilotinib versus imatinib in newly diagnosed chronic myeloid leukemia in chronic phase: ENESTnd 10-year analysis. Leukemia. 35:440-453.

15. Cortes JE, Kim D-W, Pinilla-Ibarz J, D le Coutre P, Paquette R, et al. (2018) Ponatinib efficacy and safety in Philadelphia chromosome-positive leukemia: final 5-year results of the phase 2 PACE trial. Blood. 132: 393-404.

16. Cortes JE, Gambacorti-Passerini C, Deininger MW, Mauro MJ, Chuah C, et al. (2018) Bosutinib Versus Imatinib for Newly Diagnosed Chronic Myeloid Leukemia: Results From the Randomized BFORE Trial. J Clin Oncol 36: 231-237.