Philadelphia-negative chronic myeloproliferative neoplasm follow-up: when the phone rings. Changes during the COVID-19 pandemic and patient satisfaction. Experience in 30 health centers in Spain

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Abstract
The SARS-CoV-2 pandemic has favored the expansion of telemedicine. Philadelphia-negative chronic myeloproliferative neoplasms (Ph-MPN) might be good candidates for virtual follow-up. In this study, we aimed to analyze the follow-up of patients with Ph-MPN in Spain during COVID-19, its effectiveness, and acceptance among patients. We present a multicenter retrospective study from 30 centers. Five hundred forty-one patients were included with a median age of 67 years (yr). With a median follow-up of 19 months, 4410 appointments were recorded. The median of visits per patient was 7 and median periodicity was 2.7 months; significantly more visits and a higher frequency of them were registered in myelofibrosis (MF) patients. 60.1% of visits were in-person, 39.5% were by telephone, and 0.3% were videocall visits, with a predominance of telephone visits for essential thrombocythemia (ET) and polycythemia vera (PV) patients over MF, as well as for younger patients (< 50 yr). The proportion of phone visits significantly decreased after the first semester of the pandemic. Pharmacological modifications were performed only in 25.7% of the visits, and, considering overall management, ET patients needed fewer global treatment changes. Telephone contact effectiveness reached 90% and only 5.4% required a complementary in-person appointment. Although 56.2% of the cohort preferred in-person visits, 90.5% of our patients claimed to be satisfied with follow-up during the pandemic, with an 83% of positive comments. In view of our results, telemedicine has proven effective and efficient, and might continue to play a complementary role in Ph-MPN patients’ follow-up.

Keywords COVID-19 · Ph-MPN · Follow-up · Telemedicine · Patient satisfaction · Spain

Introduction
The SARS-CoV-2 pandemic has deeply changed our way of making medicine, and hematology is not an exception. During the worst of it, we were forced to implement telemedicine, in order to decrease virus transmission, while maintaining continuity of medical care [1][1].

These changes, although originally obliged, have finally proved useful, and apparently, are here to stay [3][3][3]. Using telehealth might reduce the risk of cross-contamination caused by close contact, provide medical follow-up in overwhelmed clinics during environmental or biological emergencies, reduce waiting lists and waiting times, and also make assistance easier and accessible for patients with physical disabilities, work/family-life issues, or living in remote areas [6]. Ensuring that telemedicine is
appropriately integrated into our health system as a usual modality will facilitate its effectiveness in the future, allowing the benefits that are not related to natural disasters or infectious disease outbreak management to remain [6]. Telemedicine is not exempted from limitations, as absence of physical examination, impersonality or potential miscommunication, lack of specific guidelines or clinician training, and requirement of technology infrastructure, which will have to be addressed [6].

Philadelphia-negative chronic myeloproliferative neoplasms (Ph-MPN), including essential thrombocythemia (ET), polycythemia vera (PV), and myelofibrosis (MF) as the main categories [7], behave stable for long periods and might be good candidates for telemedicine follow-up. In fact, previous experiences before the pandemic had already suggested that telephone follow-up could be useful in order to avoid unnecessary displacements and waits [8].

Recently published studies pointed out that during the COVID-19 pandemic, some diagnostic and therapeutic approaches were postponed or decreased in patients with MPN. Most of the follow-up was made by phone; though differences between entities were noted, being in-person visits much more frequent in MF. Patient satisfaction with virtual healthcare seem to be high [9] and most of the participating hematologist affirm that they will go on using telemedicine after the pandemic [1][1][1].

In the present study, we aimed to analyze the follow-up of patients with Ph-MPN during the COVID-19 pandemic in Spain, and whether it was homogeneous among different institutions. We additionally collected data about patients’ experiences and opinions about these changes. Regardless of the pandemic, we lastly wanted to assess, to what extent follow-up visits were effective and useful, or if on the contrary, many of them were expendable. We believe that our results could be useful to optimize the monitoring of MPN patients, making their follow-up as efficient as possible during and outside of emergency situations.

Materials and methods

Study design

This was an observational multicenter ambispective study performed in Spain with the participation of thirty healthcare institutions, all members of the Spanish Ph-MPN Group GEMFIN (Grupo Español de Enfermedades Mieloproliferativas Filadelfia Negativas).

The recruitment period covered September to December 2021. Inclusion criteria implied that patients had an adequately established Ph-MPN diagnosis and were in active stable follow-up in the Hematology consultation since at least a year before recruitment time. ET, PV, and MF were included. Patients with unclassifiable MPN, AML transformation, and recent diagnosis were excluded. Each center was requested to include a minimum of 20 patients, at least 5 of them with MF.

For each selected patient, the hematological follow-up since the beginning of the COVID-19 pandemic was analyzed, including all medical visits from March 2020 to February 2022. Electronic medical records were systematically reviewed and data was incorporated into a standardized data collection form. All information was collected according to local data protection laws. Additionally, patients fulfilled satisfaction surveys.

Informed consent was obtained from all participating individuals. The study protocol was approved by the clinical ethics committee of Gregorio Marañon General University Hospital, the lead site of the study.

During the defined follow-up period, thorough information about medical visits including number, date, and type of visit (in-person, phone contacts, or video calls) along with performed treatment changes, phlebotomy, and blood transfusion requirements was compiled. Results were compared according to Ph-NPM diagnostic subgroups and age range (groups were defined as <50 years (yr), 50–70, and >70 yr). Physicians were requested to subjectively assess whether each conducted in-person visit could have alternatively been a telephone or video call contact. Additionally, doctors had to evaluate for each visit the disease-control degree and if the patient could have benefited from an earlier visit. No specific disease-control criteria were established, so the assessment was led to the judgement of the treating physician. Virtual visit effectiveness was assessed by considering effective a phone or video consultation that satisfactorily replaced an in-person visit, regarding communication of symptoms, analytical monitoring, and treatment adjustments; a virtual visit which needed a complimentary in-person appointment shortly afterwards was considered ineffective. A last section related to SARS-COV2 infection was included.

Questionnaires for patients were in a hybrid format with multiple choice and free-response questions asking about their level of satisfaction towards medical follow-up, telemedicine in general, limitations, benefits, comparisons to in-person visits, and suggestions on future use.

Statistical analysis

A descriptive analysis of the demographic and clinical data was performed. Categorical variables were reported in counts and percentages; continuous variables were expressed as the median and interquartile range (IQR) or range.

Non-parametric tests were performed due to the absence of normal distribution of most of the studied variables. Chi-square statistic was used for testing relationships between
categorical variables. Krustal-Wallis test and post hoc analysis were applied to compare categorical with continuous variables. A p-value of < 0.05 was considered statistically significant.

Statistical analyses were performed using IBM SPSS Statistics version 25 and Epitad 3.1 software.

Results

541 Ph-MPN patients were included. Table 1 summarizes their demographic and clinical characteristics.

Ph-MPN diagnosis, natural history, and management

At recruitment time, 48% (n = 260), 29% (n = 157), and 23% (n = 124) were ET, PV, and MF patients respectively. There were diagnosis changes from the initial ones, mainly due to disease transformation into secondary myelofibrosis (SMF). The rate of SMF transformation was 13.2% (39/296) for ET and 16.5% (31/188) for PV (Table 1).

Regarding MPN management, 80.2% of the patients had required cytoreductive treatment at some point. Detailed information about pharmacological treatment, phlebotomy/transfusion requirements, and thrombotic complications is shown in Table 1.

Two patients died during follow-up, one patient from COVID-19, and the other from lung cancer.

Number and periodicity of visits

With a median follow-up of 19 months (IQR 17–20 m), a total of 4410 hematology appointments were recorded. 37.5% of visits (n = 1653) were for ET patients, 27% (n = 1194) for PV, and the remaining 35.4% (n = 1563) for MF.

The median of visits per patient was 7 (IQR, 5–9), with significant differences by Ph-NPM subtype: 6 visits per ET (5–7), 7 for PV (6–9), and 12.6 for MF patients (7–15) (p < 0.001). The median of visits was not different by age range (< 50, 50–70, > 70 yr).

The median periodicity of visits was 2.7 months (IQR, 1.9–3.4), again with significant differences among MPN subgroups (p < 0.001), with a frequency of visits of every 3 months for ET (IQR, 2.5–3.8), 2.7 months for PV (2–3.2), and 1.7 months for MF patients (1.3–2.5).

Regarding the median and periodicity of visits, moderate homogeneity was observed among different medical centers. However, the ET subgroup showed more variability with median intervals ranging from 2.1 to 4.8 months depending on the hospital (p = 0.017).

Comparing the 3 centers with a higher frequency of visits with the 3 centers with the lowest, we noticed that more changes of treatment per visit (31.5 vs 21.5%, p = 0.0005) and a higher proportion of patients arriving with a suboptimal disease-control status (according to the researcher criteria) (18 vs 3%, p < 0.0001) were recorded, among hospitals which met patients more frequently vs. centers with a lower periodicity of visits.

Modality of visits: in-person vs telemedicine

Out of 4410 appointments, 60.1% were in-person visits, 39.5% telephone contacts, and 0.3% videocall visits. The complete distribution is detailed in Table 2. A predominance of telephone visits for ET and PV patients over MF was noted (48.5% and 45.3% vs 25.7%, p < 0.001) as well as for younger patients (< 50 yr) over older (50–70 and > 70 yr) ones (48% vs 39% and 36%, p < 0.001).

When comparing the proportion of phone contacts among the 30 centers, wide differences were noted, with percentages ranging from 18 to 75%. Only 6 patients (1.1%) from a single center had virtual appointments in a videocall format (n = 15, 0.3% of total visits).

Impact and utility of visits

Analysis of the utility of medical visits is detailed in Table 3. Regarding pharmacological treatment, modifications were performed in only 25.7% of the visits, equally distributed among Ph-MPN subtypes. If we consider transfusion support and phlebotomies, 68.1% of the visits involved no management modifications. ET patients presented a significantly higher proportion of visits with no global treatment changes when compared to PV and MF patients (73.7% vs 65.2% and 64.6%, p < 0.001).

According to the researcher criteria, patients arrived with suboptimal disease control in 6% of medical visits; this proportion appeared to be higher for the PV subgroup vs TE and MF (9.9% vs 4.9% and 4.3%, p < 0.0001). We did not collect data about therapeutic compliance.

In order to explore a possible association between disease control and the predominant modality of follow-up, we compared the group of patients who arrived suboptimally controlled at some point during the follow-up (n = 143) vs. patients who did not (n = 398). There appeared to be no statistically significant differences regarding the proportion of virtual and in-person consultations among them (p = 0.779); one-third of patients in both groups (26.8% and 30.9%, p = 0.331) had a predominance of virtual visits (more than 60% of the total). We then compared the group of patients for which virtual consultation was the main modality of follow-up (> 70%) vs. patients who had mostly in-person visits.
| Characteristic | Entire cohort $(n = 541)$ |
|----------------|--------------------------|
| Age at recruitment time (median, range), yr | 67 (21–94) |
| < 50 $\%$ | 81 (15%) |
| 50–70 | 236 (43.6%) |
| > 70 | 224 (41.4%) |
| Women $(n, \%)$ | 304 (56.2%) |

**Natural history of the disease**

Initial diagnosis $(n, \%)$

- ET 311 (57.5%)
- PV 175 (32.3%)
- MF 55 (10.2%)

Diagnosis at recruitment $(n, \%)$

- ET 260 (48%)
- PV 157 (29%)
- MF 124 (23%)

Year of diagnosis (median, range) | 2014 (1976–2021)

Time to transformation or diagnosis change (median, IQR), yr

- MF to ET $(N = 1)$ 6 (6–6)
- PV to ET $(N = 2)$ 1 (1–1)
- ET to PV $(N = 15)$ 7 (3–10)
- ET to MF $(N = 39)$ 7 (4–12)
- PV to MF $(N = 31)$ 11 (7–14)

**Therapeutic management**

Number of previous treatments $(n, \%)$

- None 107 (19.8%)
- 1 350 (64.7%)
- 2 56 (10.4%)
- $\geq 3$ 16 (3%)

Previous treatments $(n, \%)$

- Hydroxyurea 411 (76%)
- Ruxolitinib 89 (16.5%)
- Anagrelide 222 (15%)
- PEG-IFN 16 (3%)
- Other (momelotinib, azacitidine, lenalidomide, busulfan….) 4 (0.7%)

Cytoreductive treatment at recruitment $(n, \%)$

- None 92 (18%)
- Hydroxyurea 246 (48%)
- Ruxolitinib 92 (18%)
- Anagrelide 51 (7%)
- PEG-IFN 10 (2%)
- Combinations 26 (5%)
- HU + anagrelide 15 (3%)
- HU + ruxolitinib 7 (1.5%)
- Anagrelide + IFN/ruxolitinib 2 (<0.5%)
- Busulfan 1 (<0.5%)
- Azacitidine ± ruxolitinib 1 (<0.5%)
- Phlebotomy requirement $(n, \%)$ 78 (14.4%)
- Transfusion requirement $(n, \%)$ 43 (7.9%)
- $< 1$ red blood cell unit per month 20 (3.7%)
- $> 1$ red blood cell unit per month 23 (4.2%)

History of thrombotic complications $(n, \%)$ 76 (14%)
(30% of telephone contacts), and found no statistically significant differences regarding the frequency of registered undercontrolled status; \( p = 0.361 \). Exploring other critical outcomes on Ph-NMP patients, 16 thrombotic events were recorded in 15 patients during follow-up. Comparing groups with and without thrombosis, the proportion of phone contacts showed no significant difference (44.5\% in the no thrombosis vs 34.3\% in the thrombosis group, \( p = 0.259 \)).

No association was found between thrombosis incidence and history of suboptimal disease control. We did not contrast disease-control rate and thrombotic complications data with the pre-pandemic period in our study.

Physicians in charge considered that 58.6\% of in-person visits needed to be face-to-face. This proportion was higher in patients with PV compared to ET, and significantly higher in MF patients against the other groups (43.3\% vs 57.1\% vs 70.7\%, \( p < 0.001 \)). In this sense, at the discretion of the responsible physician, 42\% of in-person visits could have been telephonic either way. This percentage was significantly higher for ET patients when compared to PV and MF (58.8\% vs 46.4\% vs 27.2\%, \( p < 0.001 \)).

Telephone contact effectiveness reached 90%; only 5.4\% required a complementary in-person appointment to fulfill management. The effectiveness rate was slightly lower for PV (Table 3).

### Table 1  (continued)

| Characteristic                                      | Entire cohort (\( n = 541 \)) |
|-----------------------------------------------------|--------------------------------|
| Arterial events                                     | 40 (53\%)                      |
| Antiaggregation/ anticoagulation (n, %)              |                                |
| Antiaggregated                                      | 407 (75.2\%)                   |
| Anticoagulated                                      | 65 (12\%)                      |
| None                                                | 81 (15\%)                      |
| Both antiaggregated and anticoagulated              | 12 (2.2\%)                     |

12 patients missing. 24 patients missing

### Table 2 Distribution of visits by modality (in-person vs virtual) and disease

| Visits                        | Entire cohort | ET | PV | MF | \( P \)-value |
|-------------------------------|---------------|----|----|----|---------------|
| Total                         | 4410          | 1653| 1194| 1563|               |
| In-person visits              | 2653 (60.1\%) | 847 (51.2\%) | 651 (54.5\%) | 1155 (73.9\%) | \( p < 0.001 \) |
| Telephone visits              | 1744 (39.5\%) | 801 (48.5\%) | 541 (45.3\%) | 402 (25.7\%) | \( p < 0.001 \) |
| Videocall visits              | 15 (0.3\%)    | 5 (0.3\%)    | 3 (0.2\%)    | 7 (0.4\%)    | -              |

1Statistically significant differences between ET-MF and PV-MF. No significant differences when comparing ET to PV.

### Table 3 Utility of visits

| Visits                                | Entire cohort | ET | PV | MF | \( P \)-value |
|---------------------------------------|---------------|----|----|----|---------------|
| Total                                 | 4410          | 1653| 1194| 1563|               |
| Pharmacological treatment modifications performed | 1134 (25.7\%) | 403 (24.4\%) | 333 (27.9\%) | 398 (25.5\%) | \( P > 0.1 \) |
| Phlebotomy was indicated               | 240 (5.4\%)   | 19 (1.1\%)   | 194 (16.2\%) | 27 (1.7\%) | \( p < 0.001 \) |
| No management changes                  | 3006 (68.1\%) | 1219 (73.7\%) | 778 (65.2\%) | 1009 (64.6\%) | \( p < 0.001 \) |
| Patient arrived with suboptimal disease control | 266 (6\%) | 81 (4.9\%) | 118 (9.9\%) | 67 (4.3\%) | \( p < 0.001 \) |
| In-person visits that needed to be face-to-face | 1555 (58.6\%) | 367 (43.3\%) | 372 (57.1\%) | 816 (70.7\%) | \( p < 0.001 \) |
| In-person visits that could have been telephonic as well | 1114 (42\%) | 498 (58.8\%) | 302 (46.4\%) | 314 (27.2\%) | \( p < 0.001 \) |
| Effective telephone contacts           | 1568 (89.9\%) | 740 (92.4\%) | 457 (84.5\%) | 371 (92.3\%) | \( p < 0.001 \) |
| Telephone contacts that required complementary in-person visit | 95 (5.4\%) | 21 (2.6\%) | 50 (9.2\%) | 24 (5.9\%) | \( p < 0.001 \) |

Bold entries show the subgroup(s) responsible for the statistically significant differences

1By the total in-person visits. 2By the total telephone visits.
March–August/21, and September/21–February/22) showed that the highest proportion of telephone visits was registered during the first semester of COVID-19 (56.2%), with a posterior significant progressive decrease in parallel with improvement of the pandemic (56.2%, 48.2%, 36%, and 22%; p < 0.001) (Graphic 1). The frequency of total visits was constant during the analyzed period, with a decrease in phone contacts at the expense of an increase in face-to-face visits.

**COVID-19**

We detected a low incidence of SARS-CoV-2 infection. Eighty-two cases (15%) were registered during the follow-up, 14 (17%) required hospital admission, 9 (11%) required supplemental oxygen, and 2 (2.4%) were admitted to the intensive care unit (ICU). One patient, not eligible for ICU admission, died. Nosocomial transmission was suspected in two cases (2.5%).

**Satisfaction surveys**

The satisfaction survey response rate was 98.3% (535/541).

Only 31% of patients reported having noticed a change in their medical follow-up, the majority of them (97%) understood the reason behind these changes, and 62% experienced it as positive.

76.6% of the cohort (n = 410) considered appropriate the number of telephone contacts. However, 56.2% of patients clarified that they prefer in-person visits with only 11.2% choosing phone visits as their favorite follow-up modality. 24.7% of the cohort declared preference for in-person visits when they had symptoms and telephone contacts when asymptomatic. Only 19.3% of patients were interested in implementing video consultations, mainly the younger ones (p < 0.001).

When considering age and MPN diagnosis, patients > 70 yr and patients with MF had a preference for in-person visits, while patients < 50 yr and with ET would rather combine face-to-face appointments with virtual follow-up (p = 0.012, p = 0.011).

Regarding the modality of the visits, 29% of the patients believed it was purely a physician’s choice while 68% felt that the decision was agreed upon by consensus.

Globally, 90.5% of patients were satisfied with follow-up during COVID-19, with 83% of positive comments. Negative comments referred to impersonality and communication deficiencies throughout telephone controls, unpunctuality of visits, and lack of physical exploration, as well as no reception of test results or medical reports after virtual consultations. Patients’ suggestions were mainly directed to improve the punctuality of calls, send medical reports by post or e-mail, and provide an accessible contact line with the hospital in case of doubts or incidents.

**Discussion**

This study represents, to the best of our knowledge, the largest series that has attempted to analyze the follow-up of Ph-MPN patients during the COVID-19 pandemic, focusing specifically on the role of telemedicine. It provides real-world data on the continuity of medical care during COVID-19, as well as on the effectiveness and safety of virtual monitoring and patient perspectives about it.

Our sample included 541 patients with ET, PV, or MF. The proportions of categories in our study do not pretend to be representative of real-life Ph-MPN distribution, as inclusion requests to the participating institutions led to a higher percentage of MF patients, in order to collect information from this group.

Analysis of medical visits revealed a clearly higher number and frequency of appointments for MF patients, receiving a 35.4% of the total visits while representing only a 23% of the entire cohort. Multiple studies have pointed out that patients with MF require a closer follow-up than other MPN individuals, due to the distinguishing features of this disease [1][1][1].

Follow-up in terms of the number and periodicity of visits appeared to be homogenous among the 30 centers. When considering subgroups, ET seemed to be the most variable, with arranged intervals for visits ranging from 2 to 5 months in different institutions.

In order to analyze the utility of visits, we collected data about how the physician considered the disease control at every visit and whether any pharmacological or other management changes were performed. Unfortunately, we did not define strict criteria for assessing disease control, and led it at the physician’s discretion, which now we feel is a weakness to interpret the data. Nonetheless, physicians reported inadequate control of the disease in a very low percentage of the visits (6%; 9.9% vs 4.9%
and 4.3% for PV vs TE and MF respectively, \( p < 0.0001 \). Regarding pharmacological treatment changes, they were only conducted in 25.7% of the visits, while in 68.1% of them, there were no management modifications, considering both medical treatment, transfusion, and phlebotomy indications. This figure is even higher in ET vs PV and MF (73.7% vs 65.2% and 64.6%, \( p < 0.001 \)).

Taking all this information together, we could be prone to think that some of the visits are dispensable, especially in ET. In this regard, we searched for associations between the frequency of visits in ET and changes in treatment or disease control, finding that patients who had closer monitoring also arrived repeatedly uncontrolled and needed more treatment modifications. These results probably indicate that centers which arranged more frequent visits had also more complex ET patients on follow-up. It seems that physicians are thus adapting to disease-control status and not diagnosis to space out follow-up appointments, which seems appropriate. Therefore, it would be difficult to establish a recommended follow-up interval, as it depends on the particular features of the patient and the disease, more than the general diagnosis. Current guidelines proposed a frequency of visits ranging from annual to monthly influenced by complications of the disease and the nature of therapeutic interventions [11–13].

Even so, we believe that our data (with weaknesses and limitations) suggests that follow-up could be spaced to some extent, especially in ET patients.

Focusing on telemedicine, 39.8% of the visits were virtual. Proportions of virtual appointments by diagnosis and age range pointed out that hematologists preferred to meet face-to-face both with MF and older patients, probably due to their management complexity including transfusion requirements, importance of physical exploration, and ease of in-person communication with the elderly. On the contrary, ET covered the great majority of telephonic appointments, presumably due to their plainer management. Physicians declared that 58% of ET in-person visits could have been telephonic either way. Conversely, almost 3 of every 4 in-person visits in MF (71%) were considered to be necessarily face-to-face. Previous publications have explored physicians’ perceptions of telehealth, drawing the conclusion that the absence of physical exploration and visual information is its main negative implication, which can make diagnosing more difficult [15].

In our study, one unique medical center performed video consultations, proving that this care modality is not yet implemented in Spain. Other European countries have reported successful experiences with video consulting among different medical specialties including Hematology, before and during the COVID-19 pandemic [15–17].

One of our most remarkable results was the high effectiveness of telephone contacts as medical visits, hitting 90%, with a fairly low percentage of visits requiring an additional face-to-face appointment to complete the medical assessment (5.4%).

We have analyzed data only during the pandemic period and therefore we cannot establish whether the degree of disease control and the incidence of disease-related complications was equal to a non-emergency period. In any case, our data showed no significant differences in the incidence of inadequate disease-control status nor thrombosis according to the predominant modality of follow-up (virtual vs in-person).

It would be interesting to report on differences in therapeutic compliance between traditional and virtual follow-up. Unfortunately, we did not collect this data systematically. Nevertheless, when asking the leading researchers, none of them declared to have noticed a relevant change regarding compliance when compared to pre-pandemic follow-up.

Bringing attention to temporal trends, we observed that the proportion of telephone visits was higher during the first semester of the COVID-19 pandemic, with a subsequent progressive decrease. Noteworthy, the number and periodicity of total visits were successfully maintained during the whole analyzed period, merely with changes in the proportion of telehealth vs in-person care. Data from the last period (September/21–February/22) might hint at the current follow-up tendency in Ph-MPN, with virtual visits representing around 22% of the total. In this respect, telephone visits are still a reality nowadays, and will probably remain, at least as a complimentary follow-up tool.

Nevertheless, the acceptance of this healthcare modality could be different among groups. In our study, the range of telephone consultations goes from 18 to 75% of the visits in different institutions.

One of the main strengths of our study is the data on patient satisfaction collected via satisfaction surveys, with a quite high response rate. The rationale for the survey was to capture patients’ attitudes, opinions, and preferences, as well as suggestions to improve follow-up in the future. Compared to similar studies including patients’ surveys, we present the greatest response rate to our knowledge, which makes the data more valuable [18].

The majority of patients declared not to have noticed a change in their follow-up. In order to clarify this unexpected result, we directly asked patients about this answer. Most explained they meant they did not notice deterioration in the follow-up, although it changed.

Most patients in our cohort felt the frequency of phone contacts was adequate. However, more than half of them stated their preference for traditional in-person visits. One out of 4 patients specified that they would like to have in-person appointments when being symptomatic and phone contacts if not. A tendency was observed for older patients to prefer in-person visits. In the same way, MF patients favored face-to-face consultations, while younger patients...
and patients with ET tended to choose to combine virtual and in-person modalities. Other studies have pointed it out in the same way [19][19]. Recent publications report that one of the biggest concerns faced by patients is the lack of a physical examination in virtual consultations, which they were afraid may lead to misdiagnosis [20][21].

Referring to video call visits, the little interest in their implementation in our study cohort must be underlined. Searching for the reasons behind this, we discovered that patients felt video call contacts might attempt on their privacy and be logistically complex and difficult to schedule. Consequently, they argued to prefer phone contacts.

An additional interesting finding from the surveys is that choice of the modality of the visit was shared between physicians and patients in most cases (68%). These results highlight that we are moving towards a flexible system in which patient demands and preferences are considered by their doctors.

Finally, we report a high satisfaction rate about follow-up during COVID-19 in Ph-MPN patients, which we can consider a success taking into account the Public Health difficulties and overload during this period. In this regard, a recent systematic review from a Polish group confirmed a high level of satisfaction with telehealth in each study across every medical specialty [18]. 82.3% of patients in this study endorsed using telemedicine again, although these opinions were collected during the pandemic, so we cannot assume patient attitudes will not change afterwards. During emergency situations, telemedicine might protect both patients and medical practitioners from certain threats, such as for example, the risk of infection during an infectious disease outbreak [6]. This major advantage would play no role outside exceptional scenarios, but there are certainly other benefits of virtual health, such as granting an easier way to conciliate family care, work-life and adequate chronic medical follow-up, avoiding unnecessary displacements and waits, and providing accessible convenient care for people living far from the hospital or with physical disabilities. In line with our results, although in the previously referred Polish systematic review telemedicine was strongly liked by patients during the pandemic, nearly 70% of them still preferred in-person visits in the future [18]. This publication concludes by emphasizing that many patients would like to be offered the choice between an in-person visit and a virtual consultation.

In order to improve telemedicine so it remains a helpful tool within everyday healthcare, we must try to implement it proactively rather than reactively and deal with its limitations, developing guidelines and technology solutions as well as ensuring appropriate training for all health professionals involved [6]. We should also listen to our patients’ suggestions and not forget to send them their test results and medical reports by post or e-mail after virtual visits, as well as provide them with a contact line to the hospital. Reaching a consensus with the patient about the modality of the visit and interspersing in-person with virtual consultations might help to improve patient acceptance and quality of follow-up, guaranteeing periodic physical exploration and promoting patient-physician relationship and trust.

Conclusion

Telemedicine allows an efficient follow-up in Ph-MPN and has proven useful to prevent both patients and medical practitioners from infection, and also grant adequate medical monitoring. Our analysis supports its role as a complementary tool in the medical assessment of this population in the future.

Due to its complexity, patients with MF will require a closer follow-up with more in-person visits, while most ET patients, especially younger ones, seem to be excellent candidates for telephone follow-up.

The way we are nowadays monitoring Ph-MPN patients translates into a low rate of therapeutic modifications per visit and a low percentage of undercontrolled patients, as perceived by the researchers. Spacing visits out in stable patients could presumably favor follow-up efficiency and patient convenience, without compromising safety, especially in ET.

We confirmed a high degree of patient satisfaction with the follow-up during COVID-19, with room for improvement in specific aspects that can be easily implemented.

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Declarations

Ethics approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Hospital General Universitario Gregorio Marañón.

Consent to participate Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors declare no competing interests.

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