



## Early View

Research letter

# Worldwide experiences and opinions of healthcare providers on eHealth for patients with interstitial lung diseases in the COVID-19 era

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Worldwide experiences and opinions of healthcare providers on eHealth for patients with interstitial lung diseases in the COVID-19 era

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**Take-home messages:**

- The COVID-19 pandemic has led to an increase in the use of eHealth for patients with ILD.
- Healthcare providers worldwide are positive towards further implementation of eHealth for research and clinical practice.

Interstitial lung diseases (ILD) comprise a group of pulmonary diseases characterized by diffuse parenchymal abnormalities, which can lead to irreversible pulmonary fibrosis(1).

In current practice, out-patient clinic visits including pulmonary function measurements every 3-6 months are typically used to monitor disease course and determine treatment strategies(2). The availability of digital technologies may enhance efficiency and precision of disease monitoring at a lower burden to both patients and clinicians, and may change routine clinical practice.

The COVID-19 pandemic has impacted almost all aspects of care for patients with ILD. Decreased hospital capacity and avoidance of face-to-face contact have fostered an accelerated implementation of eHealth. Replacing outpatient-clinic visits with video consultation and home-monitoring of patients have been proposed as strategies to provide ongoing care for patients with ILD, given their increased risk for severe outcomes associated with COVID-19 infection(3-6). However, the extent to which healthcare providers (HCPs) have implemented eHealth in daily practice, and their perspectives on digitalization of care for patients with ILD have not yet been assessed. These insights will help further shape digital healthcare.

The aim of our study was to characterize the experience of HCPs around the world on eHealth tools for patients with ILD, and to understand opportunities and barriers for further implementation of eHealth and home-monitoring in this patient population.

Between October 2020 and January 2021, HCPs with ILD expertise were invited by email to complete a 28-question online survey using Survio®([www.survio.com](http://www.survio.com)). HCPs provided informed consent for participation. eHealth was defined as “the use of technology to improve health and/or quality of healthcare”, and online home-monitoring as “tracking clinical results measured at home using an online

application". Microsoft Excel and SPSS statistics version.25.0.0.1 were used for data collection and analysis.

In total, 286 HCPs from 54 different countries responded: 89.2% were pulmonologists, 7% rheumatologists, 1.7% ILD specialist nurses, and 2.1% others. Mean age was 46 years(SD9.9), and 50% were male. 52.8% of HCPs had over 10 years of experience with care for patients with ILD, and 49.7% reported seeing more than a hundred patients with ILD per year.

62.2% of HCPs stated that patients are able to communicate with the ILD clinic via email, and 36.0% reported that patients have the possibility to view their own clinical records online.

Approximately half of HCPs currently use eHealth; a minority (8.4%) already started before the COVID-19 pandemic(Figure 1A). Of the HCPs with eHealth experience (n=157), 39.5% use it in daily care, 25.5% for research purposes, and 35.0% for both research and daily care. All respondents from Oceania (100.0%, n=6), and the majority from North America (77.6%, n=58), and South America (58.5%, n=41) used eHealth. In Europe, approximately half of participating HCPs (47.7%, n=149) currently use eHealth, and in Asia around one-third(35.5%, n=31). The only African HCP in this survey did not use eHealth. The most frequently used forms of eHealth are video consultations (67.6%), online patient portals (30.2%), online home-monitoring (21.8%), and online self-help applications (8.9%). Of the HCPs without experience (n=129), 41.9% state that they would like to use eHealth, but don't know how to set it up.

HCPs would like to monitor home-based oxygen saturation, symptom scores, side-effects, physical activity levels, quality of life, and home spirometry. However, only a minority are currently collecting these parameters(Figure 1B). Few HCPs also mentioned interest in environmental exposures, treatment compliance, tele-rehabilitation, laboratory results, blood pressure, and heartrate as part of home-monitoring.

Almost all HCPs (96.5%) believe online home-monitoring to be of added value, either for improving quality of care, research or registry purposes(Figure 1C). If patients collect online data, 75.2% of HCPs would like to have access to the results; 18.9% would want patients to contact their HCP if their condition worsens. Only 1% think home-monitoring data are of predominant interest for patients. Three-quarters of HCPs stated that they would like to receive automated alerts if data collected by patients show disease deterioration. Currently collected online data is mainly followed up by medical specialists, ILD specialist nurses, and research nurses. Most HCPs (80.8%) would like to have contact with patients via video consultations.

Implementation of eHealth may also pose challenges. Technical issues were mentioned as the main challenge by most HCPs, followed by reimbursement, reliability, privacy, and ethical issues(Figure 1D). Other mentioned hurdles for implementation were management and interpretation of large volumes of data, suitability of eHealth for some patients, accessibility, and time and human resources to monitor results. 59.8% of HCPs stated that they do not have staff available to teach patients how to use home-monitoring applications. 34.3% stated that there is no reimbursement for eHealth in their country, and 37.8% do not know if there is reimbursement available.

Our results reveal that most HCPs were positive towards implementation of eHealth, including online home-monitoring applications, not only for daily care, but also for research and registry purposes. Before the COVID-19 pandemic, less than 10% of HCPs used eHealth. The COVID-19 pandemic has stimulated the implementation of eHealth for patients with ILD, with half of surveyed HCPs currently using a form of eHealth.

Most HCPs would like to use different home-monitoring applications, such as home-based oxygen saturation, symptom scores, side effect monitoring, physical activity trackers, quality of life measures, and home spirometry. Previous studies have shown that online home-monitoring is feasible, reliable and

can even be beneficial for patients with ILD(7, 8). A home-monitoring program integrated with home spirometry improved general wellbeing of patients with ILD, and provided opportunities to tailor medication use(7, 9). Interestingly, oxygen saturation was the most desired parameter to measure at home. This may have been influenced by the COVID-19 pandemic(10), though it is also considered an important measure to monitor disease course and guide titration of oxygen supplementation in ILD, regardless of COVID-19(2). Notably, three-quarters of HCPs would like to monitor physical activity levels, which is done infrequently in current practice. Until now, few studies have evaluated the use of physical activity trackers in ILD(11-13). Physical activity trackers may be useful to monitor and predict disease deterioration over time, encourage patients to exercise, and enable tele-rehabilitation(11-13).

Few HCPs currently use home-monitoring applications for research or clinical care, which may be due to the barriers identified in this survey. Most HCPs have no staff available to instruct patients and follow up results, and reimbursement for eHealth is lacking. Technical and analytic issues were encountered in previous home spirometry studies(14, 15). This is consistent with our survey results, with technical issues being the most frequently reported hurdle. To facilitate implementation of eHealth in regular care, focus should be on improving technical infrastructure, optimization of automated alert settings and related legal requirements, establishing financial reimbursement plans, and developing training programs for patients and caregivers. Attention should be paid to the impact on quality of care and suitability for different patient groups. For research and registry purposes, consensus documents on technical and analytical requirements are needed to ensure standardized collection and privacy-compliant sharing. To enable wide-scale implementation of eHealth for patients with ILD both during and after the COVID-19 pandemic, these challenges should be addressed.

A limitation of the study is the possibility that HCPs with pre-existing interest in eHealth preferentially responded to the survey, leading to selection bias. However, due to the high number of responses from

HCPs around the world, we believe our results represent the experiences and opinions on eHealth of a diversity of HCPs.

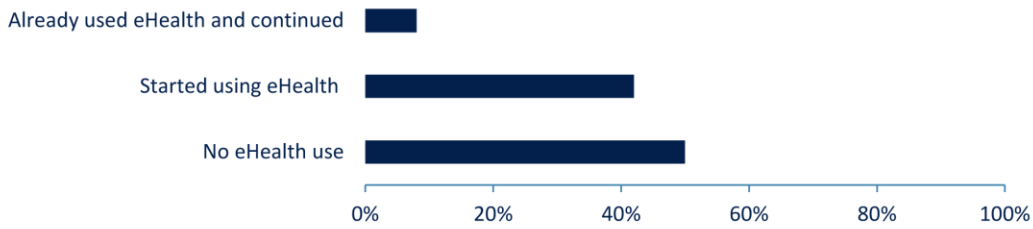
In conclusion, this study shows that HCPs worldwide are positive towards implementing eHealth applications. These results are encouraging and can be used to shape further integration of eHealth in care and research for patients with ILD.

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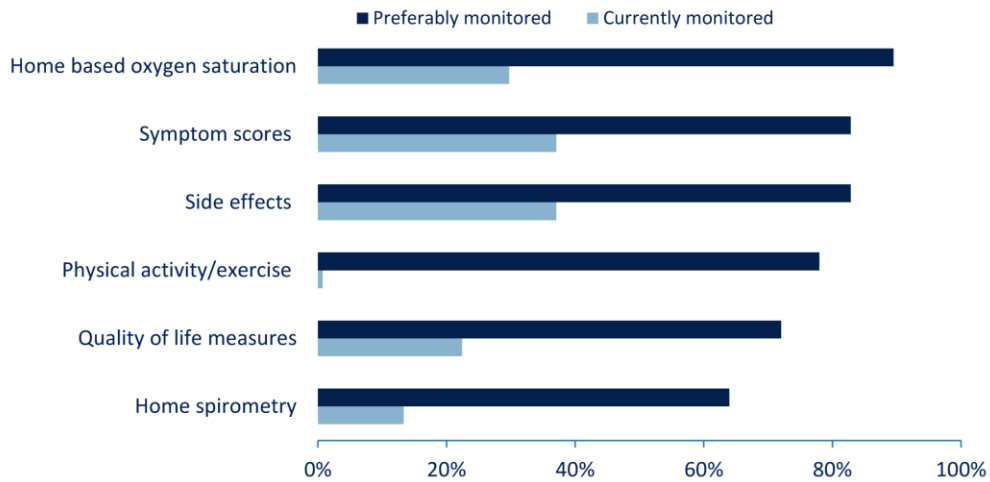
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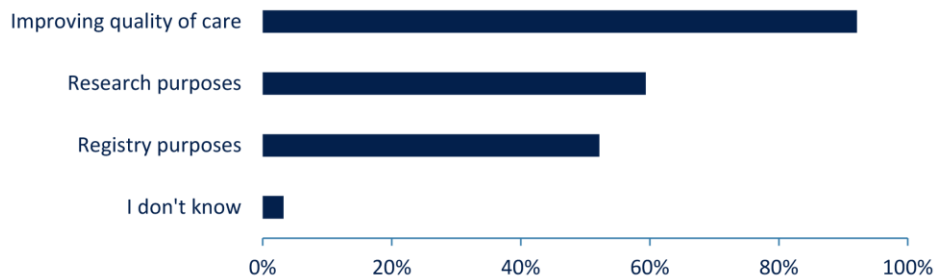
### A. Effects of the COVID-19 pandemic



### B. Preferences and current use of home monitoring



### C. Added value of online home monitoring



### D. Hurdles for implementation

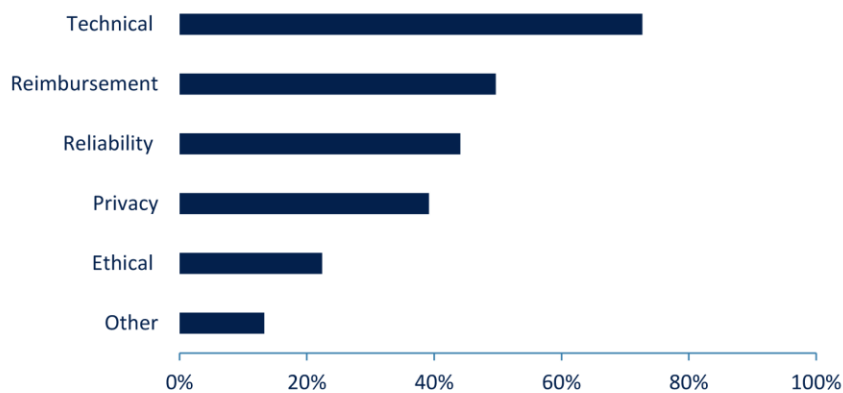


Figure 1. Worldwide experiences and opinions on eHealth for patients with ILD