

# Challenges and opportunities in implementing telemedical solutions for COPD management in the Polish healthcare sector: a presenting own experience

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## ABSTRACT

**Aim:** The aim of this article is to present and discuss the conclusions of a finalized pilot project implementing telemedical solutions for COPD management within the senior population in Wrocław and the Lower Silesian Voivodeship during 2022-2023. It also aimed to contribute to the development of innovative strategies to improve care for individuals with COPD through the use of telemedical technologies.

**Materials and methods:** An interdisciplinary and comprehensive pilot project in pulmonology was applied, dividing it into health, organizational, and technological areas. The steps and data collection strategy were presented, enabling the implementation of telemedical solutions among COPD patients in Poland.

**Results:** The implementation of telemedical solutions in COPD represented an innovative approach to improving care. Among the main goals of the project were to reduce patient waiting times, enhance disease progress monitoring, and provide access to specialized healthcare through the use of modern telemedical technologies. Various telemedical solutions were implemented, including remote monitoring of health parameters, online consultations with pulmonology specialists, and patient education on self-monitoring of symptoms. The final summary of the materials collected within the described methodology allowed for a holistic view of the implementation of telemedicine in pulmonary healthcare in Poland, using the discussed pilot project as an example.

**Conclusions:** The analysis of the pilot project implementing telemedical solutions in the field of pulmonology in the Polish healthcare sector has shown that telemedicine can improve care for COPD patients. The project's outcomes indicate the potential for reducing patient waiting times and better monitoring of disease progression. However, these aspects require improvement and refinement, particularly in terms of systemic solutions.

**KEY WORDS:** telemedicine, pulmonology, chronic obstructive pulmonary disease, opportunities, challenges

## INTRODUCTION

The rising incidence of chronic obstructive pulmonary disease (COPD) necessitates innovative approaches to patient care [1]. Telemedicine has emerged as a crucial tool for improving COPD management by enabling continuous health monitoring and remote consultations [2,3]. Telemedical solu-

tions offer significant potential in monitoring and managing COPD by enabling continuous tracking of lung function through self-administered spirometry tests. Patients can use specialized spirometric devices linked to telemedical platforms to measure their lung capacity regularly [4]. These measurements are then transmitted to healthcare providers, allowing

for real-time assessment and individualized treatment adjustments. This approach not only facilitates timely medical interventions but also empowers patients to actively participate in their health management [5, 6].

Telemedical platforms also enable remote pulmonology consultations, where specialists can analyze spirometry results, provide advice, and adjust treatment based on current data. This eliminates the need for frequent visits to medical facilities, especially for patients with limited mobility, allowing for effective healthcare in the comfort of their own homes [7]. The self-performance of spirometry by patients aligns with the trend of health education and motivation for self-care. Telemedicine offers interactive educational tools that allow patients with COPD to understand the importance of regularly monitoring lung function [8]. Moreover, access to personalized information about spirometry results can motivate patients to adhere to medical recommendations, reinforcing their engagement in the treatment process [9–11].

The introduction of telemedicine and e-health for monitoring patients with COPD, with an emphasis on self-performing spirometry, not only improves the quality of care but also increases the accessibility of medical services [12]. Thanks to these innovations, COPD patients can actively engage in managing their health, while enabling doctors to monitor the progress of the disease and quickly respond to any deterioration in health [13]. This contemporary approach to caring for COPD patients integrates modern technologies into the daily management of the disease, contributing to an improvement in their quality of life [14].

The seamless integration of telemedicine not only enhances accessibility to healthcare but also fosters a proactive and informed patient-doctor partnership, fostering a holistic and patient-centered model of care [15, 16]. This collaborative approach empowers patients to take an active role in disease management, providing them with valuable insights into their health and promoting a sense of control [17]. Additionally, it allows healthcare providers to deliver personalized and timely interventions, ultimately leading to more effective and patient-tailored care [18–20].

Considering the ongoing challenges related to the care and rehabilitation of patients with COPD, the implementation of modern solutions becomes imperative for improving pulmonary care and rehabilitation [21, 22]. This article summarizes a pilot project aimed at implementing and testing innovative tele-

medicine solutions in the field of chronic diseases. This project, conducted in 2022–2023 in Wrocław and the Lower Silesian Voivodeship, represents a step forward in the transformation of healthcare, focusing on adapting modern technologies to the specific needs and challenges associated with caring for patients with COPD.

By focusing on the practical implementation of telemedicine solutions, this project not only explores the potential of modern technologies but also emphasizes the tangible benefits they can bring to patients, medical staff, and the healthcare system as a whole. Encompassing areas such as the analysis of pulmonary needs, selection of appropriate technologies, staff training, testing effectiveness, and acceptance assessment, this project sheds light on the comprehensive process of adapting telemedicine in COPD.

However, despite the benefits, there are several potential disadvantages and challenges associated with the use of telemedical platforms for COPD patients such as (1) patient compliance: ensuring that patients consistently use the telemedical devices and adhere to monitoring protocols can be challenging; (2) data security concerns: the transmission and storage of sensitive health data over digital platforms raise concerns about data privacy and security; (3) technical support: patients may require ongoing technical support to effectively use telemedical devices, which can be a barrier, especially for elderly patients who may not be technologically savvy; (4) limited access: not all patients have access to the necessary technology or reliable internet connections, which can limit the reach and effectiveness of telemedicine interventions; and (5) integration with existing systems: integrating telemedical data into existing healthcare systems and workflows can be complex and may require significant changes to current practices. Addressing these challenges is crucial for the successful implementation and sustainability of telemedical solutions in COPD care.

In this article, a closer look will be taken at the key stages of the project, with the obtained results, conclusions, and prospects for further development being analyzed. The introduction of telemedicine into the field of pulmonology is not only opening up new diagnostic and therapeutic possibilities but also raising the question of how to best tailor these modern tools to the unique needs of COPD patients. Acting as a bridge between traditional care and innovative technologies, this project contributes to the creation of a more accessible, effective, and personalized pulmonary care for COPD patients.

## AIM

The aim of this article is to present and discuss the conclusions of a finalized pilot project implementing telemedical solutions for COPD management within the senior population in Wrocław and the Lower Silesian Voivodeship during 2022-2023. The article intends to analyze the challenges and opportunities associated with the implementation of these innovative solutions in the Polish healthcare sector. By delving into the project's experiences and evaluating the effectiveness of telemedical technologies in the context of COPD, this article aims to provide practical insights that may support the further development of pulmonary care in Poland.

## RESULTS

To achieve the goals set for this article, an interdisciplinary and comprehensive research framework was applied. The steps and data collection strategy that enabled the goal of analyzing the implementation of telemedical solutions in chronic diseases, using COPD as an example in the Polish healthcare sector, are presented below. For each project, the goal, scope, applied telemedical technologies, and gathered data were thoroughly analyzed. This information served as a starting point for identifying key issues related to the implementation of telemedicine in the care of individuals diagnosed with COPD. The effectiveness of patient health monitoring was assessed, clinical benefits were identified, and potential challenges related to the interpretation and management of health data in pulmonary healthcare were evaluated. The level of acceptance of telemedical technologies by patients, their understanding of experiences, and expectations regarding modern e-health solutions in healthcare were identified. The final summary of the materials collected within the described methodology allowed for a holistic view of the implementation of telemedicine in pulmonary healthcare in Poland, using the discussed pilot project as an example.

## MATERIAL AND METHODS

An attempt was made to identify challenges and draw conclusions to contribute to the development of innovative strategies to improve care for patients with COPD. The implementation of the project was summarized in the health, organizational, and technological areas. Key indicators from the implementation of the pilot project were also presented in relation to the assumptions of the project proposal within the Polish healthcare system.

The project involved individuals above 18 years old who have given informed consent to participate and have been diagnosed with COPD. The target group included not only the patients themselves but also Primary Health Care (PHC) doctors, nurses, specialist pulmonologists, and, to some extent, caregivers of patients (legal or actual). Patients received health support and education, while the medical staff will gain additional knowledge and qualifications related to caring for patients with COPD, including the use of telemedicine solutions. Caregivers of patients received information about the functioning of the telemedicine platform, which is the basis for the provided services, and acquired knowledge in the field of health education directed to both them and the patients [23].

The main goal of the project was to conduct tests aimed at confirming the effectiveness of a solution that could later be implemented on a larger scale, such as nationwide. The project focused on monitoring the progress of COPD and predicting exacerbations of the disease through constant monitoring of health and performance parameters using self-administered spirometry. It is assumed that the number of patients covered by the project will be 520 individuals, with an equal distribution of gender, taking into account the standard distribution in the population. The estimated number of caregivers is around 20% of this figure, or about 100 individuals. The medical team will consist of 10 specialists, 9 PHC doctors, and 9 community nurses [23].

The project does not favor any of the groups, allowing testing the model as a universal solution applied in the general healthcare system without any access limitations. Nevertheless, following the program's objectives, priority in participation will be given to individuals from municipalities in excluded areas, i.e., those with income per capita below the national average. This approach aims to ensure the achievement of the set indicators and direct support primarily to residents in areas that are challenging for private or public healthcare, especially in locations distant from major cities, where the healthcare service market may be limited [23].

## RESULTS AND DISCUSSION

### HEALTHCARE FIELD

The summary includes an assessment of the project's impact on the health domain, focusing on clinical and health outcomes. The effectiveness of telemedicine in improving diagnosis, monitoring,

and treatment efficiency for patients with COPD was analyzed. Potential health benefits for patients, such as improved quality of life, reduced waiting time for medical assistance, and decreased hospitalizations, were also considered.

The project aims to increase access to healthcare services, especially through telemedicine, which is a key objective. However, the primary goal is to improve the quality of life for patients and enhance their sense of security, regardless of their place of residence. The telemedicine platform enables early medical interventions, which are crucial for the effectiveness of patient care. In the context of COPD, the project focuses on telemonitoring symptoms at the patient's home, allowing the anticipation of exacerbations. This is an important tool in managing the health of patients with this chronic disease. By early detection of COPD exacerbations, the project contributes to reducing adverse health effects for patients, which can have a significant impact on improving their quality of life.

The project focuses on efficiently organizing the appointment system, adapting it to the individual needs of patients suffering from COPD. As part of a three-month telemedicine-based medical care, individuals registered to participate in the project have access to various services. The process begins with registration at the project promoter's headquarters or partner locations, as well as during organized medical events. Subsequently, patients respond to their managing physician's proposal or contact the project through a special phone number. During the three-month care period, patients have access to two consultations or teleconsultations with a primary care physician, one educational consultation with a nurse or physiotherapist, and one consultation or teleconsultation with a pulmonology specialist. This comprehensive appointment system aims to ensure effective medical and educational care through the use of telemedicine for individuals with COPD.

The project offers patients broad access to education through electronic and printed materials, providing essential information and recommendations regarding health and lifestyle management recommended for individuals at risk of COPD exacerbation. Patients use a dedicated application installed on their own phone or provided free of charge during the initial project participation visit, especially if they do not have internet access. A key element is the user-friendly spirometer, allowing independent measurement of respiratory parameters at home. Spirometry results are transmitted to the project staff through the telemedicine platform, and if necessary, patients receive support from an assistant during home spirometric

measurements, with the option to report alerts by phone in case of deteriorating health. The project concludes with a summary of participation in the form of a document that patients can share with their managing physician after the project ends, including the spirometry results obtained during the project. This comprehensive approach aims to provide patients with comprehensive care, education, and monitoring of their health in a home setting.

The project provides patients with extensive access to education through electronic and printed materials, delivering essential information and recommendations regarding health and lifestyle management recommended for individuals at risk of COPD exacerbation. Patients use a dedicated platform on their own phone or a tablet provided free of charge during the initial project participation visit, especially if they do not have internet access. A key element is the user-friendly spirometer, allowing independent measurement of respiratory parameters at home. Spirometry results are transmitted to the project staff through the telemedicine platform, and if necessary, patients receive support from an assistant during home spirometric measurements, with the option to report alerts by phone in case of deteriorating health. The project concludes with a summary of participation in the form of a document that patients can share with their managing physician after the project ends, including the spirometry results obtained during the project. This comprehensive approach aims to provide patients with comprehensive care, education, and monitoring of their health in a home environment.

Based on the conducted pilot, pulmonary recommendations indicate that the Program may be too advanced for patients with mild obstruction. It is recommended that such patients receive information from their primary care physician (PCP) to be aware of when their condition may exacerbate. Potential inclusion in the Project should occur after assessment in the PCP, conducted due to exacerbation, with spirometric examination. The PCP, using the guidelines provided on the platform, should decide on the possible participation of the patient in the Program. In case of doubts, the PCP should consult their decision with a pulmonologist available on the telemedical platform. For patients with severe obstruction, continuous spirometric monitoring is not recommended, as such patients should be under the constant care of the attending pulmonologist. The pulmonologist, familiar with the specificity of the measurement results and relevant examinations for the specific patient, can effectively oversee their health. Patients with severe obstruction are usually aware of the deterioration of

their condition, and any issues related to actions in such a situation should be discussed with the attending pulmonologist.

The patient with moderate obstruction would benefit the most from inclusion in the telemedical care program. In the case of such a patient, the PCP or pulmonologist should suggest participation in the Program and initiate training on using the spirometer. Individuals with moderate obstruction, at risk of exacerbation, should receive, in addition to the password for the telemedical platform account assigned to the attending physician, a pulse oximeter and educational materials on monitoring health through the platform. After several health monitoring visits (monthly or after an exacerbation) in the PCP, the patient may receive a simple spirometer for home use. The condition is that the patient, after several spirometry tests performed in the presence of the PCP, will be able to independently conduct a reliable spirometric examination. Including spirometry in the PCP visit for a patient with suspected COPD is in line with the Ministry of Health's strategy, which aims to expand the competencies of primary care physicians, reflecting in legal regulations.

## ORGANIZATIONAL FIELD

The focus was on the impact of the project on healthcare organization, identifying changes in the organizational structure and workflow of medical staff. The adaptation of administrative and logistical systems to the implementation of telemedicine was also analyzed, paying attention to potential time and resource savings.

In terms of project management, procedures were conducted to select members of the Project Management Team; members of the project team were hired, and their responsibilities were defined; the project regulations and documents for the Leader and partners were created. Difficulties encountered in the project implementation included a lack of widespread interest among physicians, who showed little enthusiasm for participating in competitions for medical roles in the pilots. This resulted in the need to primarily involve the potential of the Promoter and Partners, responsible for creating the funding application. Another challenge was the significant workload on physicians in the Polish healthcare system, requiring the organization of their participation in the pilot in a way that allowed for the automation or delegation of the most time-consuming organizational tasks to assistants.

In the area of preventive and promotional activities in public health, comprehensive promotional materi-

als were developed as part of the Project Promotion Strategy, including leaflets, posters, public transport displays, radio banners, and a radio spot. Additionally, promotional activities were initiated during the project's opening conference, and a dedicated website was created. To increase the effectiveness of the promotion, a request was made to include a sub-measure related to advertising during a trip to Norway. During the project implementation, the emphasis of promotion was shifted from scattered print publications to organized promotion during the closing conference of the project. However, difficulties were encountered, mainly related to the financing of the pilot project, which necessitated adherence to competitiveness principles when selecting providers of promotional services. The diversity of promotional activities and the internal conditions of the beneficiaries made the application of competitive procedures for promotional activities time-consuming. Furthermore, the limited project implementation schedule created additional challenges in coordinating efforts on promotional elements.

In the scope of testing model solutions in partnership with primary care entities, cooperation was established through the signing of partnership agreements with 9 entities. The change in the project schedule had a significant impact on the possibility of cooperation due to changes in employment and the involvement of partners in other tasks. As a result, it was necessary to involve new partners in the project. Within the project implementation, medical staff were hired, and project staff were trained in the operation of the telemedical platform, as well as the principles and documents used in the project. Progress in project work was regularly presented, and any risks were discussed during the meetings of the pilot assessment and supervision team. However, difficulties were encountered, especially regarding the digital competencies of doctors, which proved crucial for the effective assumption of roles by doctors in the project. Lower levels of digital competencies among doctors resulted in a lower number of conducted patient visits. Additionally, the lack of the ability to verify the impact of the incentivizing fee for visits for primary care and specialist doctors posed a significant problem in the pilot's implementation.

Regarding the informational and promotional activities of the project, diverse promotional materials were developed as part of the strategy for promoting project results, including brochures, posters, public transportation displays, broadcast banners, and a closing conference for the project, along with the creation of a dedicated website. Efforts were also

**Table 1.** Key indicators of the geriatric project

Indicator	Achieved Value (n)	Target Value (n)	Performance Indicator (%)
Number of beneficiaries (female)	143	260	55%
Number of beneficiaries (male)	110	260	42%
Number of individuals expressing satisfaction with services received through new e-health methods according to the implemented model	253	520	49%
Number of healthcare services provided with the assistance of purchased modern equipment	271	1560	17%
Number of primary healthcare units covered by telemedical service	9	9	100%
Number of organizations (primary healthcare units, foreign partners, patient organizations, domestic partners) collaborating with the Leader in the implementation and validation of the project	12	12	100%
Territorial scope of the project: Number of counties whose residents participate in the project	4	4	100%
Experience of the Applicant and Partners: Number of entities with experience in implementing at least one project in the field of e-health or telemedicine	5	5	100%
Project management: Number of entities that will apply PRINCE2 project management methodology and an approach in line with the principles of equality management and equal opportunities policy in project management	12	12	100%
Number of patients diagnosed with geriatric conditions: sarcopenia, malnutrition, frailty syndrome based on online consultations and questionnaires conducted with the patient	0	520	0%
Increase in the level of knowledge about using medical services online among project participants	253	520	49%
Increase in the level of knowledge about geriatric diseases according to the model, the way they are diagnosed, principles of prevention and treatment involving telemedicine, among project participants (verification based on a sample of participants in the focus group)	253	520	49%

made to promote the project's results during a trip to Norway. Significant changes involved coordinating the promotion of project outcomes, shifting the focus from scattered print publications to an organized promotion during the conference concluding the project. However, difficulties were encountered due to the funding of the pilot project, where 85% of the funds came from Norwegian Funds and 15% from the State Budget. This necessitated the selection of promotional service providers while adhering to competitive principles. Competitive procedures for promotional activities proved time-consuming due to the diversity of planned actions and internal conditions of the beneficiaries. The rigid project implementation schedule, which was not flexible and allowed too little time for task completion in relation to their complexity, was also a limitation (Table 1).

## TECHNOLOGICAL FIELD

Regarding the purchase of equipment for testing model solutions, the project procured necessary equipment for testing model solutions, including tablets with internet access for digitally excluded patients, laptops for medical and administrative staff, spirometers, and ensured the operation of a help desk. However, the tight schedule of project implementation resulted in increased financial risk, especially due to the need to announce procurement even at the stage of processing the project financing agreement. Additionally, patients showed reluctance to use tablets borrowed from the Program Implementers, preferring to use their own phones or computers. In the context of spirometers, difficulties arose related to the availability of devices meeting the requirements for transmitting spirometry results to the telemedical

platform, as well as patients' ability to independently perform spirometry at home, which does not guarantee the correct execution of this test.

Regarding the action related to building the platform for telemedical services, the project selected a telemedical platform provider and conducted training for doctors on its use, as well as substantive support for workshops for patients. Effective manuals and operating procedures were developed, and technical support for conducting visits with patients was also provided. However, difficulties arose due to time constraints. The time needed to conduct the procurement procedure for selecting a spirometer supplier affected the timing of starting this process. The inflexible project schedule required simultaneous training for doctors, implementing recruitment, and working on the tool, which should have been separated in time. Lack of time also prevented the full development of procedures for emergencies or the improvement of technological solutions. The need for ongoing collaboration between the telemedical platform provider and the spirometer supplier was demanding and excessively engaged Project Coordinators and Assistants.

## CONCLUSIONS

The implementation project and testing of pilot telemedical solutions in COPD represented an innovative approach in the Polish healthcare system. Among the main goals of the project were reducing patient waiting times, improving disease progress monitoring, and ensuring access to specialized healthcare through the use of modern telemedical technologies. During the project implementation, the focus was on identifying risks associated with COPD and implementing effective management strategies. Various telemedical solutions were introduced, such as remote monitoring of health parameters, online consultations with pulmonology specialists, and patient education on self-monitoring of symptoms.

The integration of the program with the telemedical platform proved effective in patient monitoring. It was indicated that patients with moderate obstruction expecting exacerbations constitute an optimal group for inclusion in the program. Early stages of the disease do not require frequent spirometric measurements, and patient motivation to provide information is low. The program's effectiveness increases during exacerbations, requiring intervention by a pulmonology specialist. Recommendations include precise guidelines for PCP and training patients in the independent use of devices, especially spirometers. Communication

between physicians plays a crucial role, and patient recruitment must be individualized and coordinated over time. The conclusions emphasize the need for flexible adaptation of the program to the disease's severity and active collaboration between medical entities.

However, several challenges and disadvantages were encountered during the project:

- *Patient Compliance:* Ensuring consistent use of telemedical devices by patients was challenging. Many patients, especially the elderly, faced difficulties in adhering to the monitoring protocols due to a lack of familiarity with the technology or forgetfulness. Regular follow-ups and reminders, as well as caregiver involvement, were implemented to address this issue.
- *Data Security Concerns:* The transmission and storage of sensitive health data over digital platforms raised significant concerns about data privacy and security. Robust encryption methods and secure data storage protocols were employed to mitigate this risk, and patients were educated about data security measures.
- *Technical Support:* The need for ongoing technical support was another challenge, as some patients struggled with the operation of the devices. A dedicated technical support team was established to provide assistance, and detailed user manuals and instructional videos were made available.
- *Limited Access:* Not all patients had access to the necessary technology or reliable internet connections. The project provided devices and internet access to digitally excluded patients, and community centers were set up to facilitate access for those who could not have the technology at home.
- *Integration with Existing Systems:* Integrating telemedical data into existing healthcare systems and workflows proved complex, requiring significant adjustments to current practices and additional training for healthcare providers. Collaborative workshops and training sessions were organized to ease this integration process.

## PRACTICAL IMPLICATIONS

Implementing telemedical solutions in the treatment of patients with COPD can have specific practical implications. Firstly, continuous monitoring of patients' health parameters enables doctors to react quickly to any deterioration in health, contributing to a reduction in hospitalizations and shorter recovery times. Additionally, remote online consultations with pulmonology specialists eliminate time and geographical barriers, allowing patients easier access to experts.



This can lead to more effective care, especially in urgent situations or those requiring rapid intervention. Patient education on self-monitoring of symptoms can increase health awareness and patient activity in managing their health. In the longer term, this may contribute to improving the quality of life for COPD patients. The insights from this project can serve as inspiration for further developing innovative care strategies for patients with chronic diseases, leveraging the potential of telemedical technologies in the Polish healthcare sector.

## LIMITATIONS

While the pilot project demonstrated promising results, several limitations should be acknowledged. First, the sample size was relatively small and may not be representative of the broader COPD patient population. Second, the study was conducted within a specific geographic region (Wrocław and the Lower Silesian Voivodeship), which may limit the generalizability of the findings to other regions with different healthcare infrastructures. Third, patient compliance with telemedical monitoring varied, which could

impact the consistency and reliability of the data collected. Fourth, the project primarily relied on self-reported data, which is subject to bias and inaccuracies. Lastly, the integration of telemedical data into existing healthcare systems posed significant challenges, and the effectiveness of these integrations was not fully evaluated.

## FURTHER RESEARCH/VVW

Based on your recommendation, the expansion of the telemonitoring system in future projects to include these additional features should be considered. Incorporating parameters such as the COPD Assessment Test (CAT), information on sputum volume and content, self-reported exacerbations, and exercise capacity will ensure a more comprehensive approach to monitoring COPD. This will not only enhance the accuracy and relevance of patient monitoring but also align more closely with the current guidelines and endpoints established by COPD GOLD. Such enhancements are expected to improve patient outcomes and provide more detailed insights into disease progression and management.

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## CONFLICT OF INTEREST

The Authors declare no conflict of interest

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