Change in CF care during COVID-19 Pandemic: Single-Center Experience in a middle-income setting

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Abstract

Introduction: The coronavirus 2019 (COVID-19) pandemic has demanded care changes for patients with chronic disease. Patients with CF are considered at higher risk of developing severe manifestations in the case of SARS-CoV-2 infection, and a need for new ways of safer care delivery has been required to avoid transmission. Objectives: To assess the impact of the lockdown during the first wave of the COVID-19 pandemic and remote monitoring on patient's health status and daily maintenance therapy in a middle-income resource setting. Methods: During the first wave of the pandemic period, we changed from regular clinic visits to telephone visit calls to monitor our patients' health condition and adherence to physiotherapy and physical exercise. Results: A total of 120 patients or their caregivers have been contacted by telephone call visits over ten weeks. During this period, 38 patients (28.33%) were identified to have pulmonary exacerbation; 89.5% were prescribed oral antibiotics, 3% were hospitalized to get iv antibiotics and 8% of the patients presented other CF complications. Most of the patients did not change the frequency of the daily physiotherapy. Moreover, 71% of the patients who performed regular physical exercise changed the frequency and the type of exercise during the quarantine period. Interestingly, mean FEV1 and body weight increased significantly and after the lockdown period. Conclusions: During the COVID-19 pandemic, the implementation of telephone contact processes aiming for CF patients' appropriate care is of great importance. Further studies are needed to evaluate patient outcomes when transitioning from face-to-face clinics to telemedicine clinics.

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Introduction

The coronavirus 2019 (COVID19) pandemic has become a significant world health problem. Clinical manifestations of COVID19 are widely variable from asymptomatic to severe illness with progression to acute respiratory distress and respiratory failure. Age, male sex and comorbidities, have been associated with worse outcomes in the general population with COVID-19, but less is known about its effects specific to cystic fibrosis (CF)[1],[2].

Viral infections cause about 60% of the acute pulmonary exacerbations in CF, leading to more severe infections than in the general population with an increased risk of complications. The H1N1 pandemic in 2009 was associated with respiratory deterioration, mechanical ventilation and caused significant morbidity in patients with CF[3],[4]. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic emerged as a major world health problem at the beginning of 2020, causing two million deaths, so far, worldwide[5],[6]. Many countries have recommended quarantine to decrease person to person transmission of COVID-19[5],[7]. All US states and most European CF centers have advised their cystic fibrosis (CF) populations to isolate socially, as they were identified as being particularly vulnerable to COVID -19 disease.[7].

Cystic fibrosis is a genetic disease in which consistent follow-up care with frequent hospital visits is required to avoid a decline in pulmonary and nutritional health[8]Infants are seen every few weeks; older children and adults are recommended to have routine check-ups every few months. It is believed that if a CF patient ceases treatment for two days, this can result in an exacerbation[8].

The COVID19 pandemic overwhelmed many countries' healthcare systems and intensive-care facilities. Many hospitals shifted their workforces to the rapidly escalating numbers of COVID-19 admissions and, for a time, closed routine clinical work, including outpatient services, to limit contamination and infection risks[9]. Thus emerged the paramount need to monitor chronic patients at home[10]. In the USA, health care payers such as Medicare and most private insurance companies have agreed to reimburse health care providers for telemedicine and telephone visits[7].

In Greece, where there are limited financial resources, telemedicine procedures were not feasible to be applied during the first wave of the pandemic. To comply with the social distancing policy and follow up with our patients regularly, our CF center contacted all its patients via phone to monitor their clinical condition and health care needs during the first quarantine period. Another measure available by the NHS applied in our center to restrict hospital visits was e-prescription via email or SMS.

The aim of this study was to assess the impact of the lockdown during the first wave of the COVID-19 pandemic and remote monitoring on patient's health status and daily maintenance therapy in a middle-income resource setting.

Method

A survey was conducted among children and adults with CF, from March 15, 2020 - the day the "extraordinary situation" was officially declared in most European countries, introducing strict measures protecting the public - until May 10, 2020, now recognized as the first wave of the pandemic.

A CF nurse performed regular telephone visit calls with the 120 children and adolescents that are being followed in our CF clinic during the quarantine period. We collected information directly from the patients or

their caregivers, asking questions regarding their weight, general condition, change in respiratory symptoms (cough, sputum, dyspnea, hemoptysis), fever, change in gastroenterology symptoms, or other CF complications, as well as adherence to medication, physiotherapy, and physical exercise. The CF multidisciplinary team (physician, nurse, physiotherapist, and dietician) performed regular meetings to discuss the issues they were pointed out in the telephone calls. If required, antibiotics or bronchodilators were prescribed for pulmonary exacerbations or a hospital visit, and possible admission was arranged.

Written informed consent was obtained from all patients or their caregivers to use the collected data for research purposes. The study does not fall under the scope of the Human Research Act.

Statistical analysis

Descriptive statistics were used to describe the study population. All parameters were described as mean and standard deviation (StDev). The Kolmogorov–Smirnov test was applied to express normality, while Spearman's Correlation Coefficients were used to assess possible correlations between the above parameters. The level of significance was set to $p < 0.05$. Statistical analysis was performed using SPSS for Windows version 20.0 (SPSS Statistics 20, IBM Hellas Inc.).

Results

We contacted 120 patients aged 1-30 years by telephone from March 05 to May 15, 2020. Before and after the quarantine period, the Mean (StDev) time between the two onsite visits in the clinic was 4.08 (1.53) months, so we decided to have at least two telephone visits during the quarantine period. The baseline characteristics of the study population are shown in Table 1.

The mean FEV1% increased significantly over the quarantine period (mean, 95% Confidence Interval ΔFEV1 (3.19; 0.36- 6.02), p= 0.028; while the mean weight increased significantly; mean, 95% Confidence Interval ΔWeight, kg (1.0; 0.61-1.4); p<0.0001. These changes were significantly greater among the younger age groups (R^2= 0.3030; p=0.014).

Several CF complications were reported over the lockdown period, Table 2. Thirty-eight out of 120 patients (28.33%) were identified to have a pulmonary exacerbation over the quarantine period, which was treated either with oral antibiotics (89.5%) or with hospitalization and use of IV antibiotics (3%). Moreover, two patients were diagnosed and hospitalized because of DIOS; one was complicated with pneumothorax, two reported significant weight loss due to new onset of pancreatic insufficiency, confirmed by abnormal faecal elastase, one patient complicated with haemoptysis, and one patient with new onset of CFRD.

Before the lockdown,79.5% of the patients reported performing physiotherapy daily, 8.2% reported performing physiotherapy 2-4 times per week, and 12.3% reported performing no physiotherapy at all. Most of the CF patients did not change the frequency of their daily physiotherapy practice during the COVID19 pandemic (Table 3). Moreover, before the pandemic, 49.2% of the CF patients performed extra assisted airway clearance; a physiotherapist visited their home once a week through a home care program. During the COVID19 pandemic period, only 27.1% of them continued this program.

Concerning physical exercise, before the COVID-19 pandemic, 97 (81%) of the CF patients were reported performing regular exercise weekly; 21.6% of them followed a combined aerobic and anaerobic exercise in a gym, 16.6% participated in outskirt team sports, like basketball or football (Table 4). During the pandemic, most patients changed the type (72% of the patients) and the frequency of exercise, with 71% of the patients performing less exercise than before.

Discussion

The current COVID19 pandemic increased telemedicine's need to monitor patients with chronic diseases like CF at home, to prevent contamination and disseminate COVID 19[10]. Although telehealth has been utilized previously in medicine in limited contexts, the onset of the COVID19 pandemic has prompted health systems worldwide to move into comprehensive telehealth monitoring.

One of the most significant achievements of our telephone visit program was the early detection of pulmonary exacerbations and infections and the corresponding antibiotic administration. As already known, surveillance for the development of pulmonary exacerbations is a fundamental component of chronic CF management. Early recognition and treatment of these episodes have an essential impact on the long-term decline in lung function, quality of life, and life expectancy[11]. We also identified patients who needed acute care and/or immediate admission to the hospital through telephone visits[5],[7].

Forced expiratory volume in 1 sec (FEV1) and the rate of FEV1 decline are significant markers of progressive lung disease and important predictors of mortality in CF patients[12]. The decline in lung function is typical of almost all patients with CF, and the rate of decline is variable with a mean value of -3.89±4% / year[9],[13]. Interestingly there was an increase in FEV1 after the lockdown period, compared to the period before the COVID19 pandemic. This may be explained by the fact that our patients had fewer chest infections, probably because of the low spread of viral infections due to the lockdown measures and the fact that CF patients have always paid close attention to infection control and social distancing[3]. Home isolation with a low incidence of viral infections, less activeness, and more ultra-processed food eating may also explain the weight gain compared to the period before the COVID 19 pandemic.

Cystic fibrosis is a progressive disease with respiratory complications such as polyps, heamoptysis, pneumothorax, and non-pulmonary complications such as DIOS and CFRD. Close monitoring of the patients, early detection, and appropriate management of these complications is vital and was a success of the telephone monitoring project.

Physiotherapy is an essential component of care among the CF population, including airway clearance, exercise, and long-term sequels of musculoskeletal issues[14]. Due to social distancing measures, most families with CF patients have stopped performing physiotherapy with a physiotherapist as expected.

On the other hand, our patients were encouraged to follow shelf physiotherapy programs and physical exercise to maintain their physical fitness. Physical exercise forms an essential part of standard care for people with cystic fibrosis as it has multiple beneficial effects[1]. It contributes to maintaining pulmonary function, especially by improving airway clearance, delays the onset of osteoporosis, improves glycaemic control in CFRD, and decreases anxiety and depression[15]. Evidence indicates additional beneficial effects of exercise on muscle mass and function, body composition, and cardiorespiratory health[16],[17]. Furthermore, exercise—aerobic or a combination of aerobic and strength—could help improve or mitigate the annual decline of forced expiratory volume in the first second and/ or peak functional capacity (VO2peak)[17],[18]. The growing evidence indicates that exercise in patients with CF is an essential therapeutic tool in reducing morbidity and mortality rates and should be considered part of the standard of care[19],[20],[21].

In the coronavirus outbreak and lockdown measures that were established, gyms have been closed, and team sports activities have been halted. Whereas a significant percentage of our CF population had made physical exercise part of its everyday life, during the lockdown days, they could not perform an exercise with appropriate prescription and monitoring, and thus they had to adapt to the new reality and change both the type and the frequency of exercise. Considering the importance of physical exercise for children and adolescents with CF, we need to encourage them to participate in alternative types of exercise programs to maintain their fitness even during the quarantine. An exercise program should be recommended and guided by a CF physiotherapy specialist and should include strength and endurance, balance and flexibility, following the principles of both ACSM[22]and EACPR[23]for exercise training.

Examples of alternative types of exercise during quarantine include aerobic exercise performed using ergometers, short walk/running movements inside the house, jumping, or skipping rope. Active videogames could also be used as a complement for their physical exercise program[24].

Adherence to chronic therapies for patients with CF is a challenging problem, as poor adherence leads to negative health consequences[25], Telephone contacts improved our patients' awareness about the importance of adherence.

Our telephone visit program during the pandemic had beneficial health effects on our CF population. The application of more sophisticated tools (home spirometry, serial 24-hour SaO2 measurements, daily calorie measurements, etc.) might have further improved our patients' individual needs and applied more precision medicine treatments. This must undoubtedly be a future goal. However, our results show that even a simple telephone visit program, which is a cheap and easily applicable solution, could have significant beneficial health effects in children with chronic diseases.

Conclusion

The implementation of a medical telephone visit program in children with CF during the COVID19 pandemic has shown significant beneficial effects on the patients' health status. It is a cheap, simple, and easily applicable solution during emergencies. It may be a good monitor for the health status, possible exacerbations of the disease, and complications. It may also help modify treatments and manage Implementing a telemedicine model in the context of the COVID19 pandemic through a standardized process. Using established tools is a feasible and sustainable process to monitor patients with chronic diseases and ensure their disease control without exposing them to the risk of COVID19 infection. Early identification of pulmonary exacerbations and CF complications and advice on all aspects of cystic fibrosis care management, including chest physiotherapy and maintaining exercise, is of great importance. During this stressful situation, communication lines remain open, and patients with cystic fibrosis do not feel isolated. Further studies are needed to evaluate patient outcomes when transitioning from face-to-face clinics to telemedicine clinics.

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