Feasibility of Using Android Smartwatches for Nearly Continuous Monitoring of Patients with COPD

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Introduction: Severe acute exacerbations of COPD are associated with mortality, diminished patients' quality of life, and accelerated decline in lung function. A proactive approach to managing COPD could involve monitoring patients closely and treating exacerbations early before they worsen. The emergence of affordable wearables allows for nearly continuous recording of audio to detect features such as coughing as well as monitoring of heart rate and physical activity. These signals can be used with predictive analytics to detect early exacerbations. Prior to full development, it is important to determine the feasibility of using wearables in patients with COPD. Previously, we described our initial experiences with one patient, and we now present our full results. Methods: We conducted a feasibility study to determine if patients with COPD will wear and maintain a smartwatch and whether sensor data could reliably be obtained from smartwatches. Patients with COPD from two hospital networks were recruited. Inclusion criteria were having a diagnosis of COPD, being able to speak English, being from home, and having an age greater than 40. Patients were asked to wear and charge a smartwatch which recorded audio, heart rate, and accelerations for 90 days. They were also asked to complete a daily symptom survey. At 90 days, participants were asked what would encourage them to use a wearable for COPD. Results: Of 175 eligible patients, 28 consented. A large number of patients were excluded because they were too ill (46) or there were cognitive issues precluding participation (32). Patients declined participation due to privacy issues (21) or being uninterested in participating in a study (15). Of the 28 patients enrolled, 16 completed the full 90 days. Patients dropped out of the study due to being too ill (5), technical problems (4), and privacy concerns (2). The average age of participants was 67.2 years, and 36% were women. When wearing the smartwatch, the average heart rate was 81, and the average percentage of sedentary behaviour and moderate-vigorous physical activity was 67% and 9% respectively. Participants desired more information from the wearables, including being able to see changes in their coughing, heart rate, and activity over time. Conclusion: Patients with COPD can be monitored with a wearable device such as a smartwatch, and smartwatch sensors can provide data on activity and heart rate. Further work is necessary to validate these signals, to determine how well these signals correlate with exacerbations, and to increase acceptability.

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