

## Abstract

# Assessing the Use of Mobile Technology in Adult Asthma Patients: Remote Observational Study

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## Abstract

**Background:** The National Institutes of Health Morbidity and Mortality report indicates that as high as 15.6% of the US population may have asthma. Non-adherence to daily controller medications is a common problem that has been reported to be responsible for 60% of asthma-related hospitalizations. Mean levels of adherence for asthma medications is estimated to be as low as 22%. Evidence suggests that patients over-report medication use when asked to self-estimate their adherence. Therefore, objective measurements of adherence to medicine is necessary.

**Objective:** The primary purpose of this study is to determine the feasibility of using the BreatheSmart platform for measuring adherence and whether it improves medication adherence to patients presenting with asthma symptoms who are managed on inhaled corticosteroids. Understanding how patients use the BreatheSmart Platform at home is essential to assess its feasibility as a solution to improve medication adherence in patients using daily inhaled corticosteroids (ICS). We anticipate this approach can be applied to real-world environments as a cost-effective solution to improve treatment plan compliance and patient self management. Secondary objectives include assessment of real-time controller medication adherence and lung function as well as frequency of rescue medication use. The result of this study allowed us to understand the process of implementing the BreatheSmart technology for management of asthma patients and facilitated the pathway to our current larger clinical trial: "Assessing the Use of Mobile Technology in Adult Asthma Patients: An Observational Study."

**Methods:** This is a virtual six-month feasibility study of 20 adults and adolescent with an asthma diagnosis, using ICS for at least 3 months. Participants were recruited in the United States through social media and web-based recruitment. All participants received wireless Bluetooth-enabled inhaler sensors that track medication usage, a mSpirometer capable of clinical-grade lung function measurements, and downloaded the BreatheSmart mobile application which transmits data to a secure server. Participants were randomly assigned to one of two arms regarding lung function measurements in order to assess usability of two different techniques. Usability was assessed by patient questionnaires and opened ended question sessions. Both primary and secondary analyses are based on intention-to-treat (ITT).

**Results:** 100% of participants interviewed (n=18) wanted to continue using the BreatheSmart app after the study, and would recommend it to a friend with asthma. 93% of study participants responded positively to their overall experience setting up the app and hardware. Participants had 84.58% adherence to scheduled doses using their HeroTracker sensors over a 6 month period. Rescue medication usage decreased by 60% in the first 3 months and 95.3% through 6 months. We observed an 86% retention of study participants for the 6-month study duration. (Commonly reported 90-day user retention rates of fitness and health apps: 27–30%.)

**Conclusions:** This study demonstrates that a mobile platform phone application is feasible in enabling patient asthma self-management utilizing a phone-based platform of digital devices and application. Study findings demonstrated a 48% lift in medication adherence from the baseline national mean medication compliance among asthma patients. Furthermore, use of the BreatheSmart platform was associated with a significant decline in rescue medication usage. Qualitative study participant feedback revealed that high patient retention and motivation to continue on the BreatheSmart platform was influenced by the reliability, simplicity and user friendliness of the platform's design. More than 50% of the study participants viewed the interactions with

the study investigator as a true value add, promoting accountability and enhanced care management. These findings should be further researched with incorporation of clinician remote monitoring to evaluate the impact of the BreatheSmart platform in enhanced clinical decision making at the point of care or between clinic visits.

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## KEYWORDS

asthma; medication adherence; mobile health; mHealth; mobile health intervention; mobile phone; mobile phones; mobile technology; mobile text reminders; patient monitoring; real-time surveillance; telehealth; telemedicine; text message; text messages; text messaging

## Conflicts of Interest

The authors would like to disclose relationships to the company Cohero Health. Authors Melissa Manice and Anna Cushing hold shares in the company Cohero Health. Melissa Manice, Anne Tam, Emilie Melvin and Jesse Cohen are employees of Cohero Health.

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