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Efforts to implement a novel smart-phone spirometer in four countries: The FRESH AIR H2020 experience

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Aim: There is unmet need for user-friendly, low-cost spirometry tools for chronic lung disease monitoring. A smart-phone based spirometer application, SpiroSmart, has potential to increase access to this test. We aim to deliver SpiroSmart for usability testing in the four FRESH AIR countries.

Method: SpiroSmart captures pulmonary function measurements via the audio signal from the forced expiratory maneuver. Its engineering occurs at University of Washington's (UW) UbiComp Lab, where Computer Science Engineering (CSE) students innovate. In September 2015 SpiroSmart development was active, but progress soon slowed as a result of an acquisition by a large tech company. A resurgence of activity by UW CSE students has resulted in several software upgrades. Each country received four iPhone 5S devices, between August 2017-January 2018. The phones are enabled with "Testflight" for downloading and updating SpiroSmart versions. Each country determines usability study sites.

SpiroSmart FRESH AIR training began at the IPCRG meeting in Colombo, Sri Lanka in August 2017, and continues by video-conferencing. At that point, the app included:

- Patient entry for trend monitoring
- Training videos in English, Russian, and Vietnamese.
- Percent predicted FEV1 display

Recent upgrades include:

- Flow Volume, Volume Time, and multiple trial curve display
- PEFr, FVC, and FEV1/FVC ratio
- Test quality confidence value
- Robust server connection

Results: All iPhones have been delivered to the FRESH AIR countries and some trainings have occurred. Primarily due to engineering issues, the usability study has yet to be fully implemented. We plan to "push" these recent updates imminently, and anticipate usability results to share in May 2018. Barriers included server instability, the app "crashing" randomly, commercial acquisition, and engineer changes. Successes also included commercial acquisition, introducing the Prime Minister of Kyrgyzstan to SpiroSmart, and increased awareness of SpiroSmart's potential among FRESH AIR stakeholders.

Conclusions: We continue to address the challenges of fully implementing SpiroSmart in the FRESH AIR countries. We remain optimistic about implementation during the FRESH AIR study timeline.

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References and Clinical Trial Registry Information