

Continuous cough monitoring with AI. Cases: treatment response, smoking cessation and COVID-19

Presented by: Mindaugas Galvosas, MD
Research and Development Department, Hyfe Inc. - Wilmington (USA)

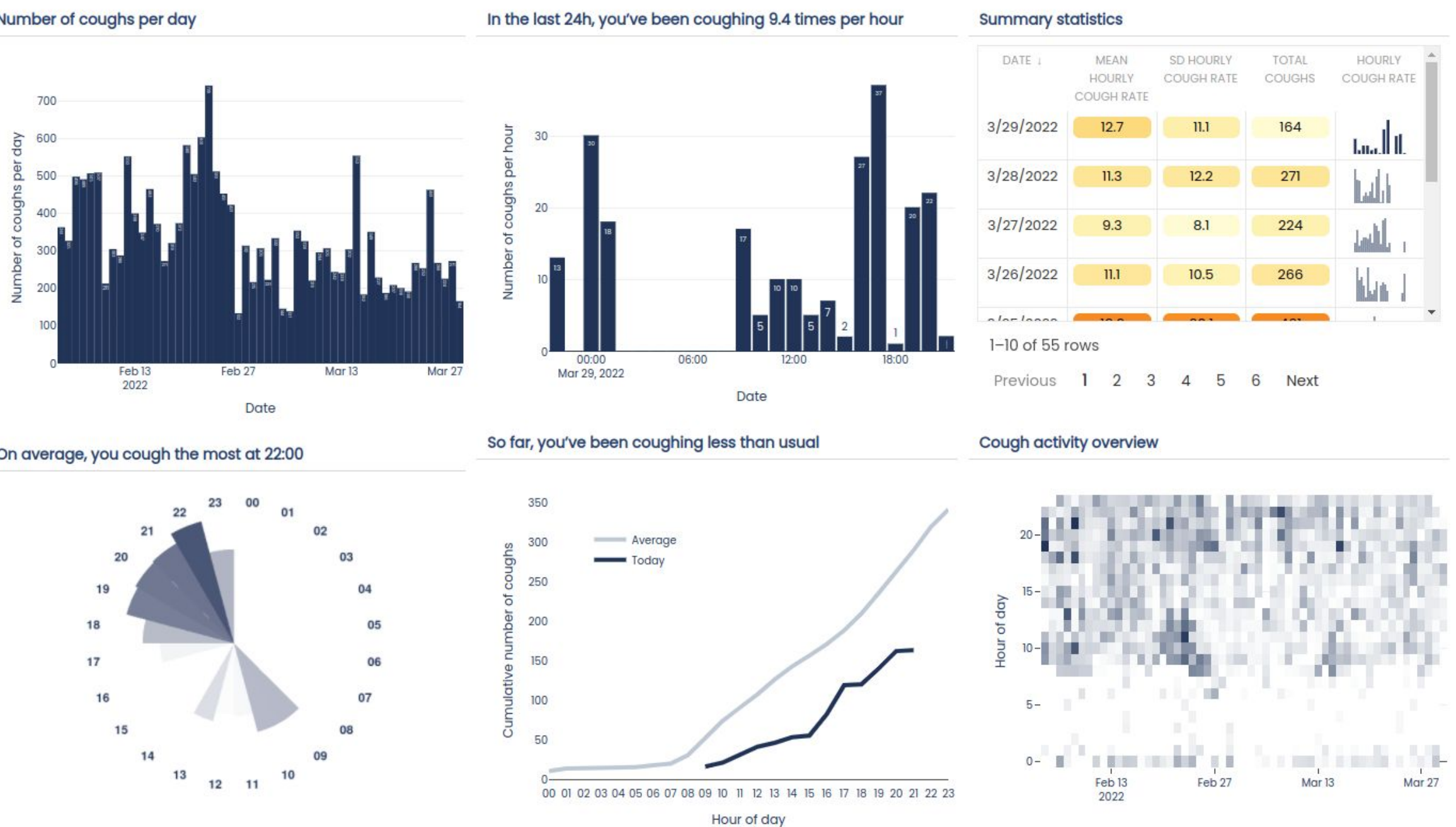
J. C. Gabaldón-Figueira, M. Galvosas, V. Orrillo, I. Blavia, J. Chaccour, A. Fernandez- Montero, N. Umashankar, N. Armendáriz, F. Javier Bartolomé, E. M. Keen, J. Brew, P. M Small, S. Grandjean Lapierre, C. Chaccour

Introduction

Despite clinical care moving towards precision medicine, cough is not routinely objectively measured.

Hyfe is an acoustic artificial intelligence (AI) system for cough monitoring, which works on smartphones and wearable devices. It works by capturing explosive sounds and recording only 0.5s sound snippets, which are then analysed by a cough classifying AI.

Hyfe was used within a study (n=616) in Navarra, Spain¹ to detect, record and count cough sounds for an aggregated duration of over 9-person years.

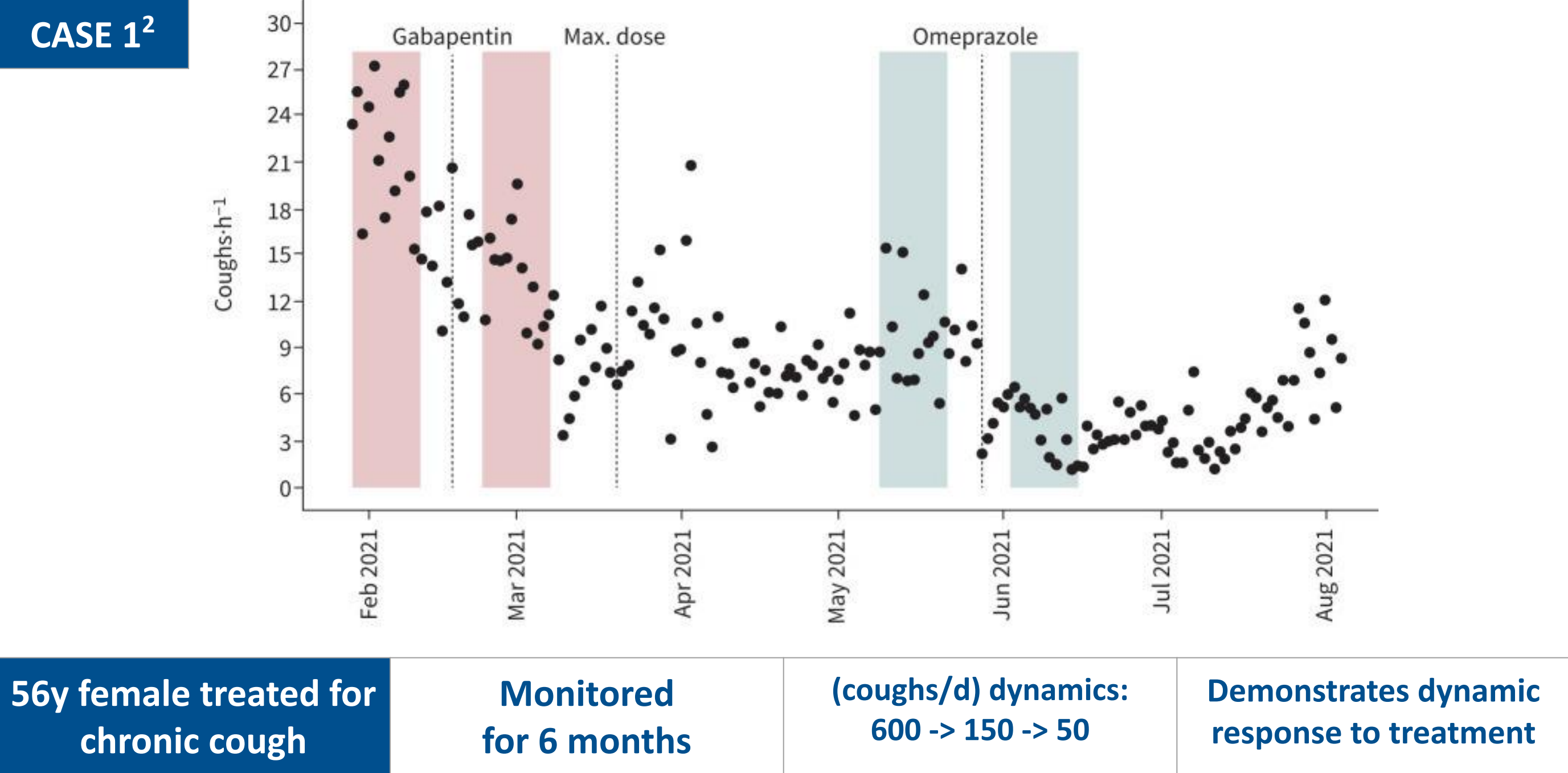


Above is a personal cough report example, generated for each patient and summarizes continuous cough frequency data over time, compares it to the average cough frequency, also allows for cough sound playback.

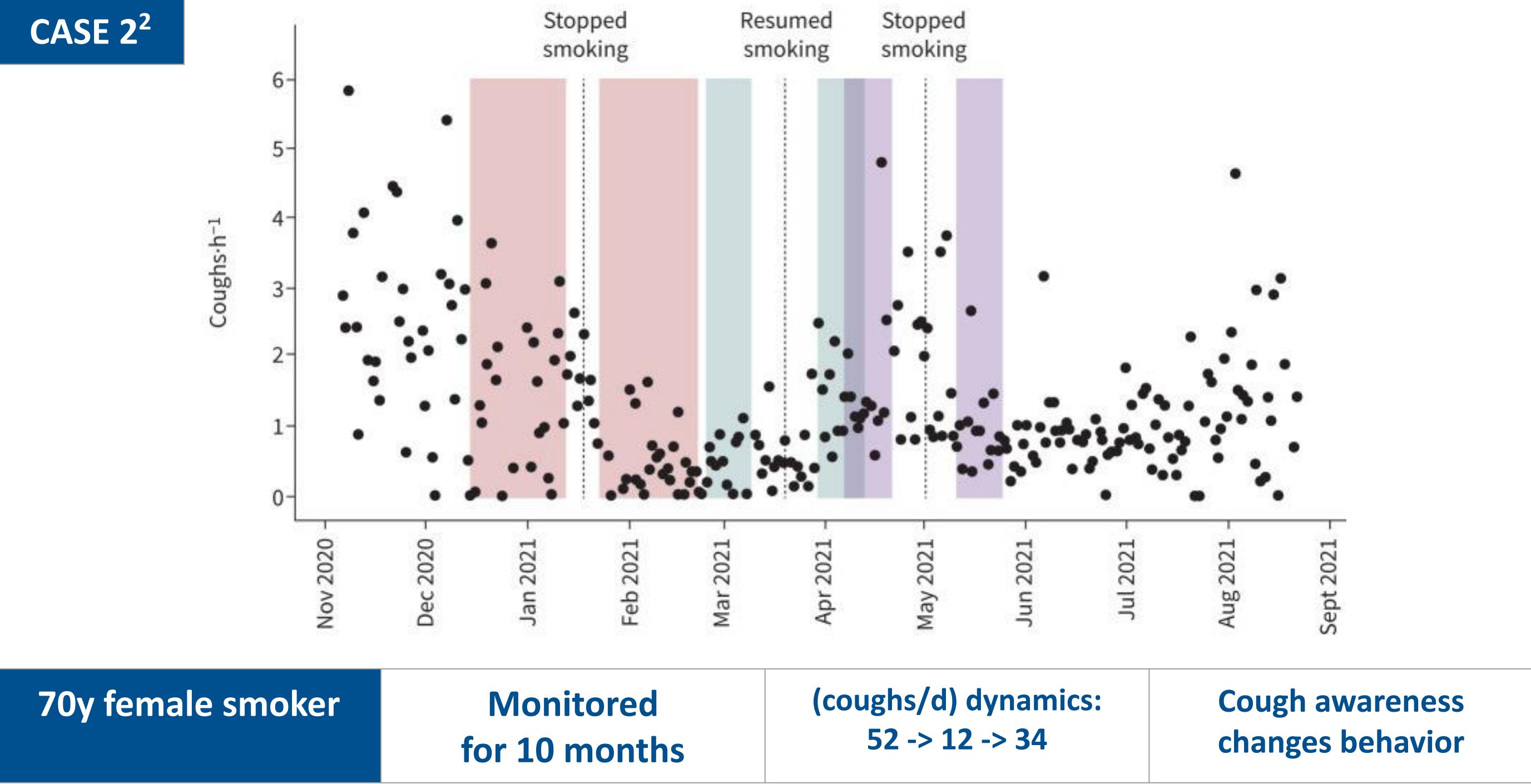
This e-poster based on our experience and case examples presented further suggests that:

- Cough should be a part of remote patient monitoring.
- Cough monitoring should be a part of smoking cessation and medication adherence.
- Continuous cough monitoring should complement PROs.

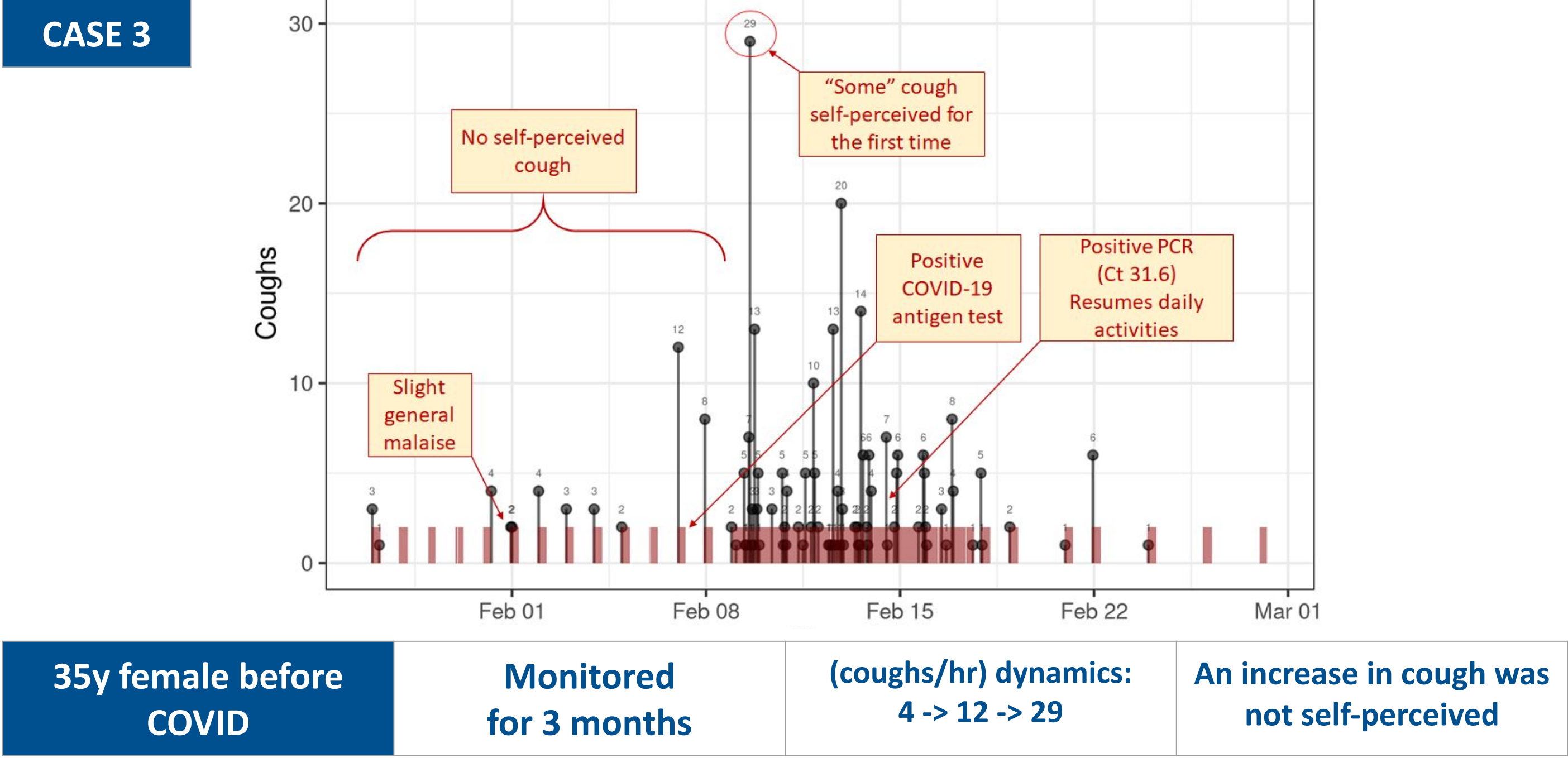
Cases and lessons learned



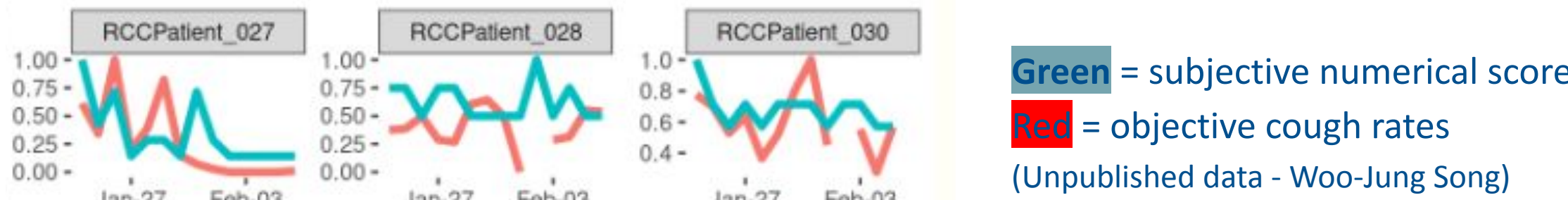
This patient was remotely monitored for treatment response during 6 months (nb: the case below - for 10 months), showing that it is technically feasible and acceptable to be continuously and unobtrusively monitored for cough frequency.



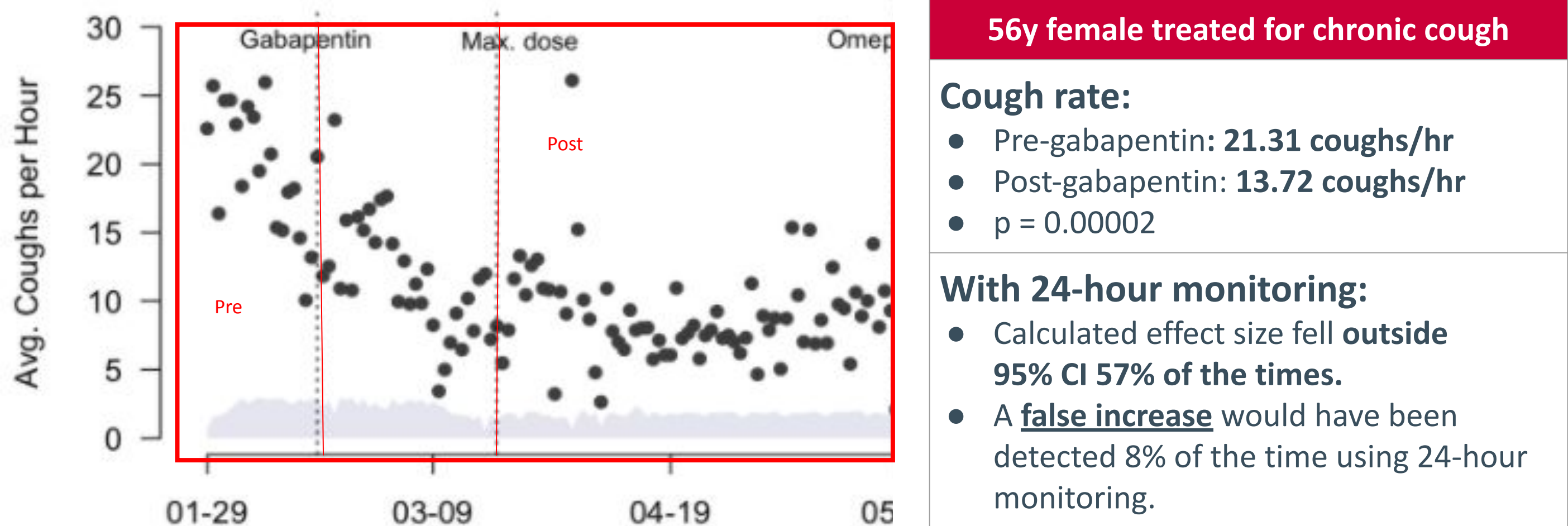
This case shows a women who quit smoking and her coughs decreased from 52 coughs/d to 12 coughs/d. When she saw the data that resuming smoking increased her cough, she quit again. It illustrates that giving objective continuous cough data to patients could be good for behavior change as in smoking cessation or medication adherence.



Objective cough counts showed that this patient's coughing increased from an average of 4 coughs/hr to 12 coughs/hr, while the patient was not aware of her cough. This prompted us to look further into the analysis of objective vs subjective cough frequency data.



During the analysis of continuous longitudinal data, we have observed that cough is stochastic, therefore, we wanted to see if the current 24-hour monitoring standard in clinical trials is an accurate measure of cough frequency.



Observing that short-term cough monitoring is misleading, we believe that continuous cough monitoring should be a part of clinical trials.

Conclusions and future plans

1. Continuous passive cough monitoring is possible.
2. Objective and subjective cough assessment needs to be further investigated.
3. Current short-term approaches in cough monitoring can be misleading.

Future plans:
Hyfe watch - available for research use later this summer.



List of references

1. Gabaldón-Figueira JC, Brew J, Doré DH, et al. Digital acoustic surveillance for early detection of respiratory disease outbreaks in Spain: a protocol for an observational study. *BMJ Open*. 2021 Jul 2;11(7):e051278. doi: 10.1136/bmjopen-2021-051278. PMID: 34215614; PMCID: PMC8257291.
2. Gabaldón-Figueira JC, Keen E, Rudd M, et al. Longitudinal passive cough monitoring and its implications for detecting changes in clinical status. *ERJ Open Res*. 2022 May 16;8(2):00001-2022. doi: 10.1183/23120541.00001-2022. PMID: 35586452; PMCID: PMC9108969.
3. Galvosas M, Gabaldón-Figueira JC, Keen EM et al. Performance evaluation of the smartphone-based AI cough monitoring app - Hyfe Cough Tracker against solicited respiratory sounds [version 1; peer review: awaiting peer review]. *F1000Research* 2022, 11:730 (<https://doi.org/10.12688/f1000research.122597.1>)

Reach out to: mindaugas.g@hyfe.ai

