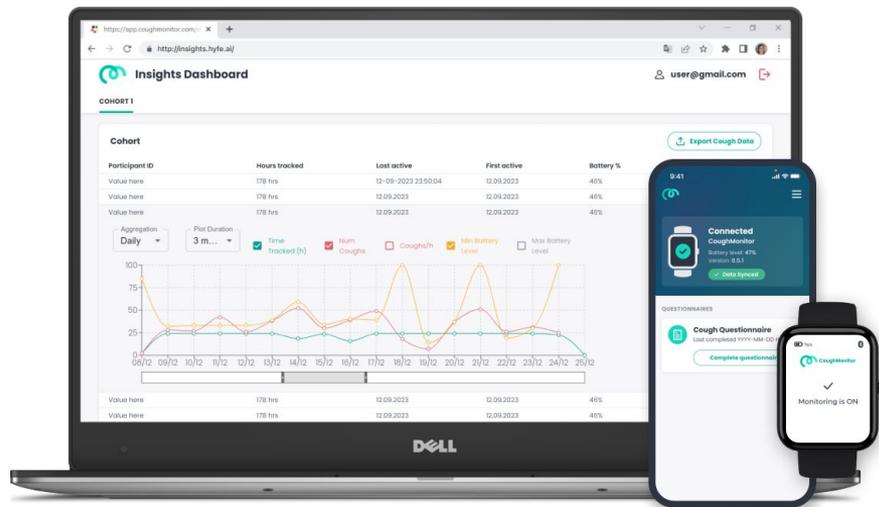


Hyfe's cough insights for Research



Trusted By

Imperial College
London



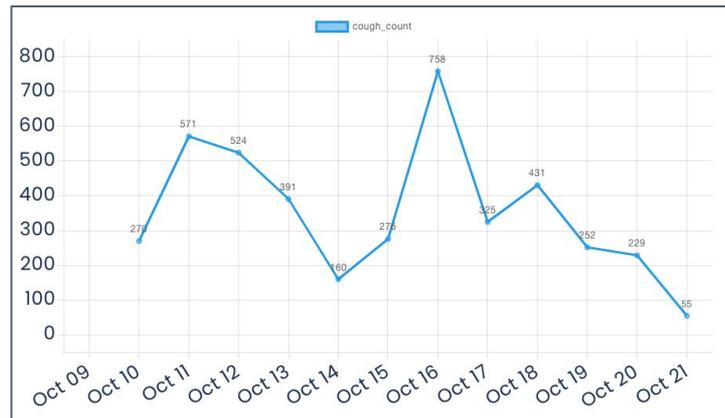
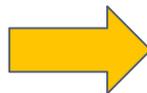
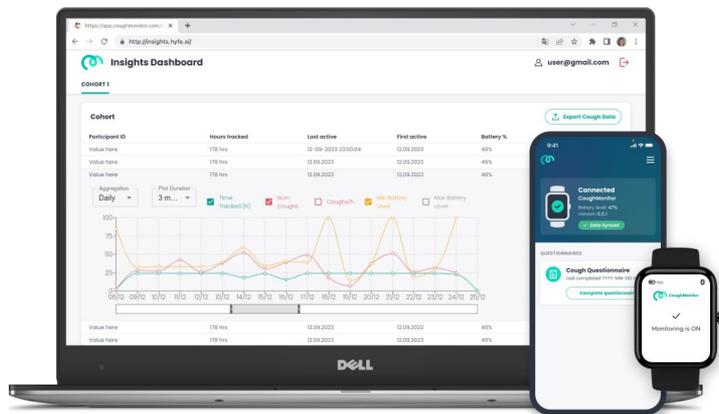
- 
- 1. Introduction to Hyfe's CoughMonitor Suite**
 - 2. Consequences of 24h snapshots**
 - 3. Patient-Reported Outcomes vs. objective cough data**
 - 4. Baseline cough rates**
 - 5. Cough variability**
 - 6. Cough predictability**
 - 7. Treatment response - change point detection**
 - 8. Diurnal patterns**

#1

Introduction to

Hyfe's CoughMonitor Suite

Hyfe uses AI to monitor **cough frequency** over time



Like a step counter, but for cough:

- Passive
- Continuous
- Fully automated
- Fully privacy-preserving

Generating longitudinal, continuous cough-frequency data, making it visible for the first time.

Hyfe's CoughMonitor Suite is comprised of:

ID206

A watch that detects and timestamps coughs.



Bluetooth

Companion App

A phone app that **collects customizable PROs** and transfers data to the cloud



Data/Wifi

Insights Dashboard

A web-based dashboard for viewing data and analysis



Plus full end-to-end execution services including study protocol support, database setup, logistics, site training, helpdesk, site performance monitoring, statistical analysis, etc., as required

AI-powered cough detection: how it works

1. Step: Peak detection & feature extraction

1st algorithm monitors environmental sound levels and identifies “explosive” sounds, e.g. a dog bark, door slam, or a cough.



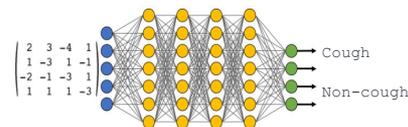
Algorithm simplifies each explosive sound to a mathematical matrix representing the key ‘features’.



2. Step: Cough classifier

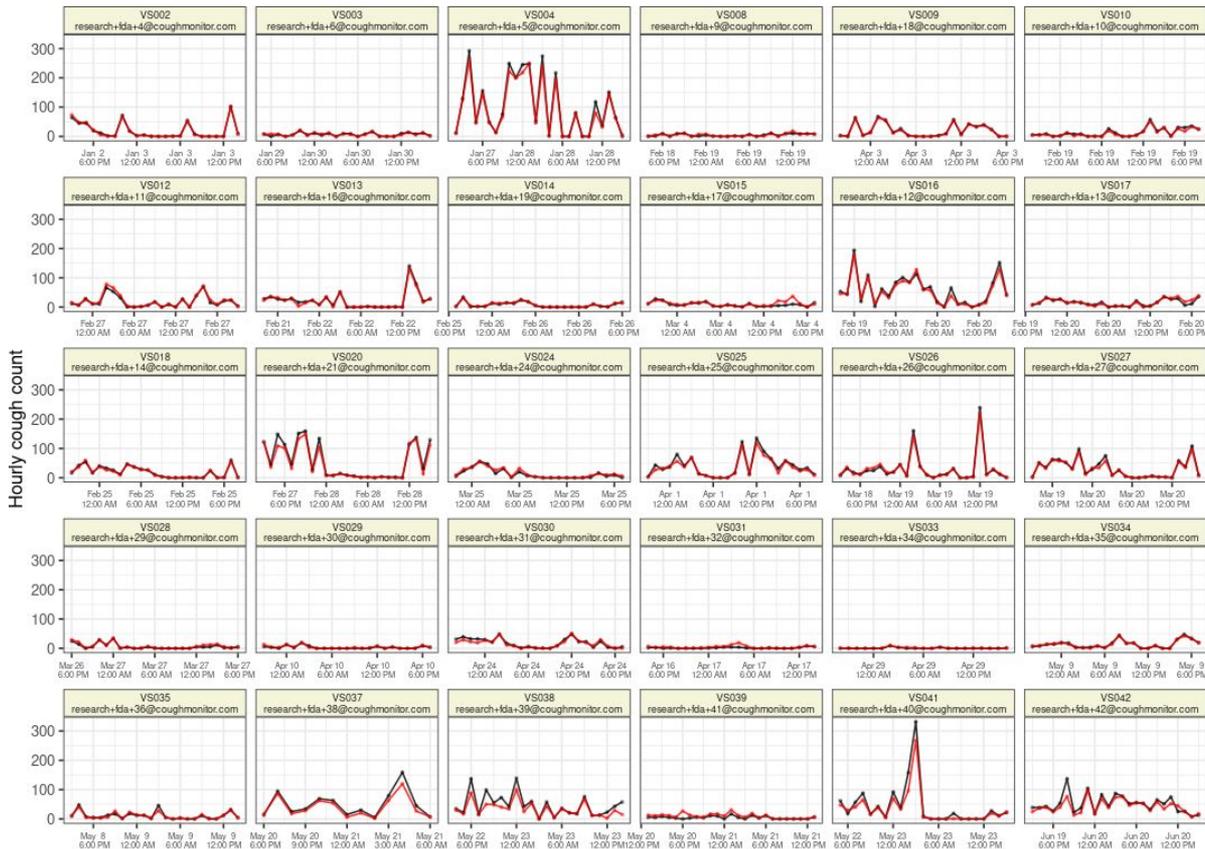
2nd algorithm reviews the ‘features’, and categorizes them as either **cough** or **non-cough**.

Each **cough** is time-stamped.



To protect users’ privacy, both peak detection and cough classification happen on-device.

Hyfe's CoughMonitor technology is analytically validated in real-world environments



30 patients in their normal daily life, monitored for 24h

Hyfe in red

Continuous audio labeled by trained humans **in black**

Transparent, thorough labeling

- Published SOP
- Labeled twice, all discrepancies confirmed by a doctor

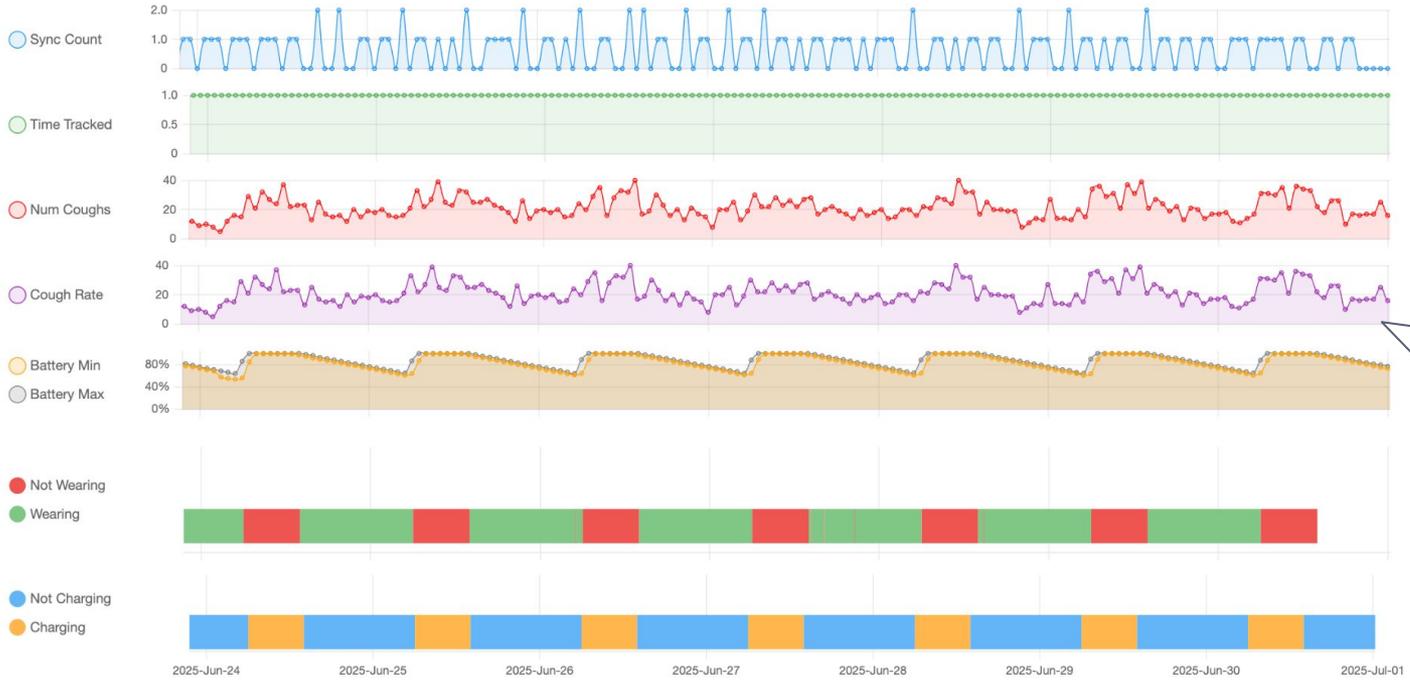
Results: Lin's Concordance Correlation Coefficient with ground truth (human annotations) for hourly counts of coughs is 0.975

Unpublished data, Hyfe Inc. 2025

Dashboard shows near real time cough data

Aggregation: Hourly ▾

Reset Zoom



Cough data can be blinded or not, per user type

Adherence (wear time/battery) visible to sites with customizable alerts

Option to download raw data from the dashboard

Designed for long-term high adherence

No privacy concerns

- Coughs processed on the watch
- Only timestamps are stored and transmitted

Watch design

- Slim, light design, in a very familiar form factor
- 3 days battery life, magnetic charger

Reliable syncing

- Automatic via Bluetooth
- Months of storage capacity in case of delayed sync

Participant alerts

- Watch & app alerts, eg for low battery
- Configurable to your study design

Site / CRA support

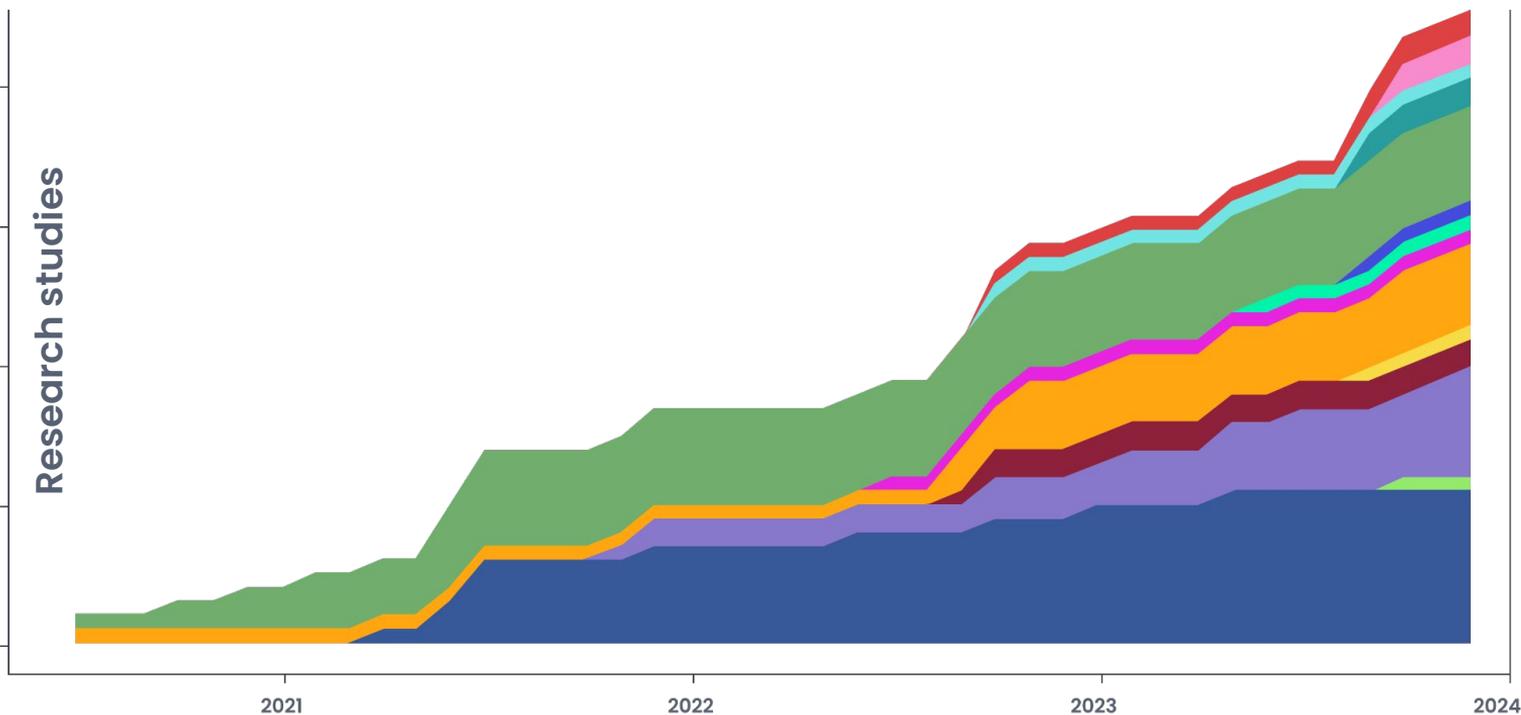
- Visual adherence data on Dashboard in real-time
- Configurable email alerts + clear actions to take

CoughMonitor Suite **summary**

Accurate insights—rich data; low patient burden

- ✓ **Validated** Observed Lin's Concordance Correlation Coefficient with ground truth (human annotations) was 0.974
- ✓ **Continuous** during **day and at night** while charging, resulting in 7/7 data for days, weeks, even months
- ✓ **Unobtrusive** watch is discrete, light, waterproof and comfortable - designed for everyday wear for long periods of time
- ✓ **Fully automated** data collection requires very minimal patient interaction
- ✓ **Privacy-preserving** all **processing completed on the watch** so no audio sent to the cloud

Hyfe is the **Global Leader** in Cough Science



55+
studies

19+
indications

22+
publications

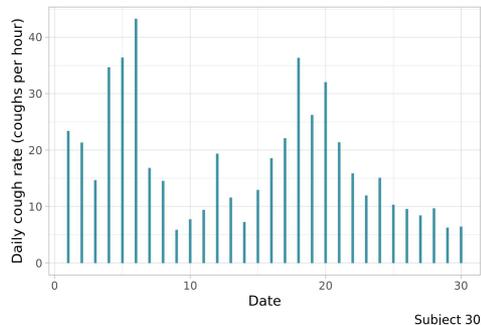


Insights from continuous cough monitoring

1. Consequences of 24h snapshots

Cough is inherently variable. Trends are only revealed by extending the observation window

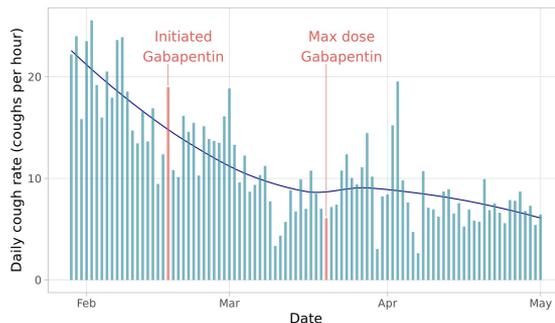
Variable cough rate impedes subject recruitment



High cough rates on some days and low cough rates on others, purely by chance

Undermines subject recruitment and efficacy analyses

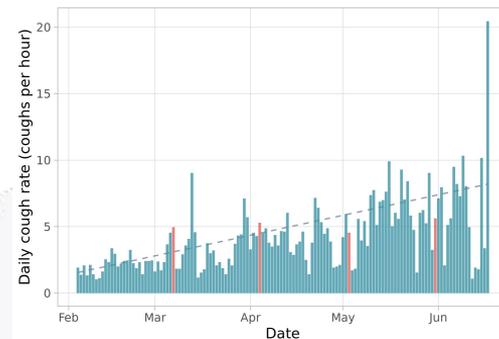
Inaccurate estimate of treatment effects



Longitudinal monitoring reveals a 35% reduction in cough rate after starting Gabapentin

24h snapshots incorrectly estimate the change more than half the time² – and can even falsely indicate an increase.

Slow detection of adverse side-effects



Glacial trend: cough rate increasing by 1 cough/hour every 3 weeks (grey dashed line)

24h snapshots (e.g. red bars, at 1 month intervals) miss the trend

²J.C. Gabaldón-Figueira, E. M. Keen et al., *ERJ Open Res.* 2022

2. Cough monitoring fills the gap between perceived and objectively measured symptom

S3 Table: Study details for correlation with patient-reported outcomes (PROs)

PRO	Author (Year)	Cough tool	Patient group	Sample size	Rho (p-value)
VAS	Bisballe-Müller (2021)	Sony ICD-PX470 Digital Voice Recorder	Asthma	24	0.26 (0.16)
			ARIs	25	0.53 (0.003)
			Bronchiolitis	35	0.56 (<0.001)
			Pneumonia	30	0.52 (<0.001)
	Fletcher (2017)	LCM	Asthma, RCC, GORD, Rhinosinusitis	320	0.43 (0.001)
	Kebbe (2024)	VitaloJAK	Pulmonary fibrosis	27	0.60 (NR)
	Kwon (2023)	Coughy app.	Pulmonary fibrosis, Interstitial lung disease	18	0.59 (0.001)
	Ovsyannikov (2019)	Custom	COPD, normal weight, no anxiety/depression	30	0.42 (0.0231)
			COPD, obese, no anxiety/depression	33	0.44 (0.003)
			COPD, normal weight, with anxiety/depression	23	-0.38 (0.005)
			COPD, obese, with anxiety/depression	24	-0.40 (0.012)
	Rassouli (2020)	Clara app.	Asthma	94	0.38 (<0.001)
	Rhee (2015)	ADAM device	Asthma (day)	42	0.38 (0.02)
			Asthma (night)	42	0.40 (0.02)
	Shim (2023)	Coughy app.	Asthma (day)	168	0.31 (<0.001)
			Asthma (night)	168	0.34 (<0.001)
	Sinha (2016)	LCM	Sarcoidosis	32	0.62 (0.001)
	Spinou (2017)	LCM	Bronchiectasis	54	0.54 (<0.001)
Sumner (2013)	VitaloJAK	COPD (night)	89	0.48 (<0.001)	
		COPD (day)	89	0.66 (<0.001)	
Turner (2013)	LCM	Asthma, COPD, LRTI	40	0.33 (0.05)	
Turner (2014)	LCM	Tuberculosis	108	0.60 (0.001)	
Yousaf (2013)	LCM	Asthma, Bronchitis, Chronic cough, COPD	78	0.66 (<0.001)	

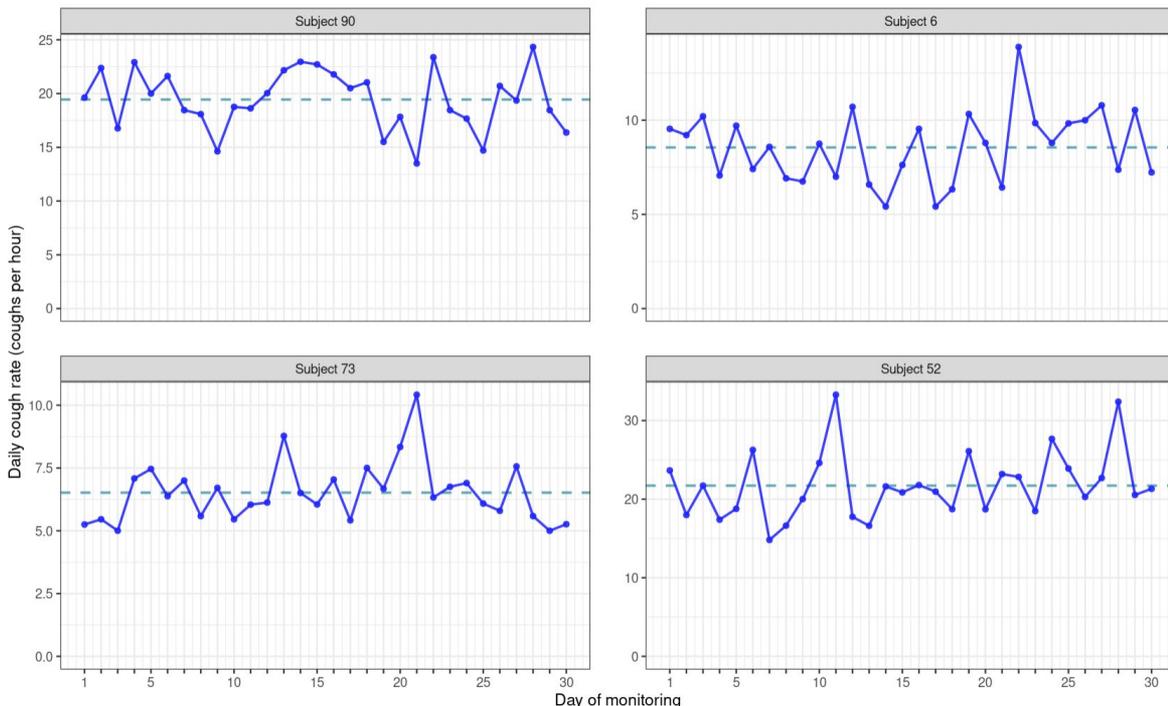
PRO	Author (Year)	Cough tool	Patient group	Sample size	Rho (p-value)
VCD	Bisballe-Müller (2021)	Sony ICD-PX470 Digital Voice Recorder	Asthma (day)	25	0.50 (0.001)
			Asthma (night)	11	-0.36 (0.26)
			ARIs (night)	16	0.39 (0.15)
			ARIs (day)	25	0.34 (0.054)
			Bronchiolitis (day)	34	0.33 (0.04)
			Bronchiolitis (night)	25	0.65 (<0.001)
			Pneumonia (day)	30	0.45 (0.002)
			Pneumonia (night)	26	0.44 (0.02)
	Lindenhofer (2020)	LEOSound	Asthma, Cystic fibrosis, Pneumonia, Habit cough, Chronic cough (night)	34	0.42 (<0.01)
			Asthma, Cystic fibrosis, Pneumonia, Habit cough, Chronic cough (day)	35	0.46 (0.01)
LCQ	Crooks (2016)	HACC	COPD	18	-0.44 (0.001)
	Fletcher (2017)	LCM	Asthma, RCC, GORD, Rhinosinusitis	320	-0.45 (0.001)
	Fletcher (2024)	Smartphone apps.	Chronic cough	10	-0.78 (0.008)
	Kwon (2023)	Coughy app.	Pulmonary fibrosis, Interstitial lung disease	18	-0.33 (0.082)
	Lee (2023)	Hyfe Cough Tracker app	Chronic cough	25	-0.57 (0.001)
	Sinha (2016)	LCM	Sarcoidosis	32	-0.61 (0.001)
	Spinou (2017)	LCM	Bronchiectasis	54	-0.52 (0.001)
	Sumner (2013)	VitaloJAK	COPD	89	-0.64 (0.001)
	Turner (2013)	LCM	Asthma, COPD, LRTI	40	-0.13 (0.48)
	Vertigan (2021)	LCM	Asthma, RCC, Laryngeal obstruction	112	-0.43 (<0.001)

“An advantage of objective cough monitoring over subjective outcome measures is that it is not susceptible to the perception of cough severity and reflects actual coughing.”

Zimmer AJ et al., Lancet Digit Health. Published November 21, 2025.

3. Baseline cough rates

Some people's daily cough rates cluster near their longer term mean frequency



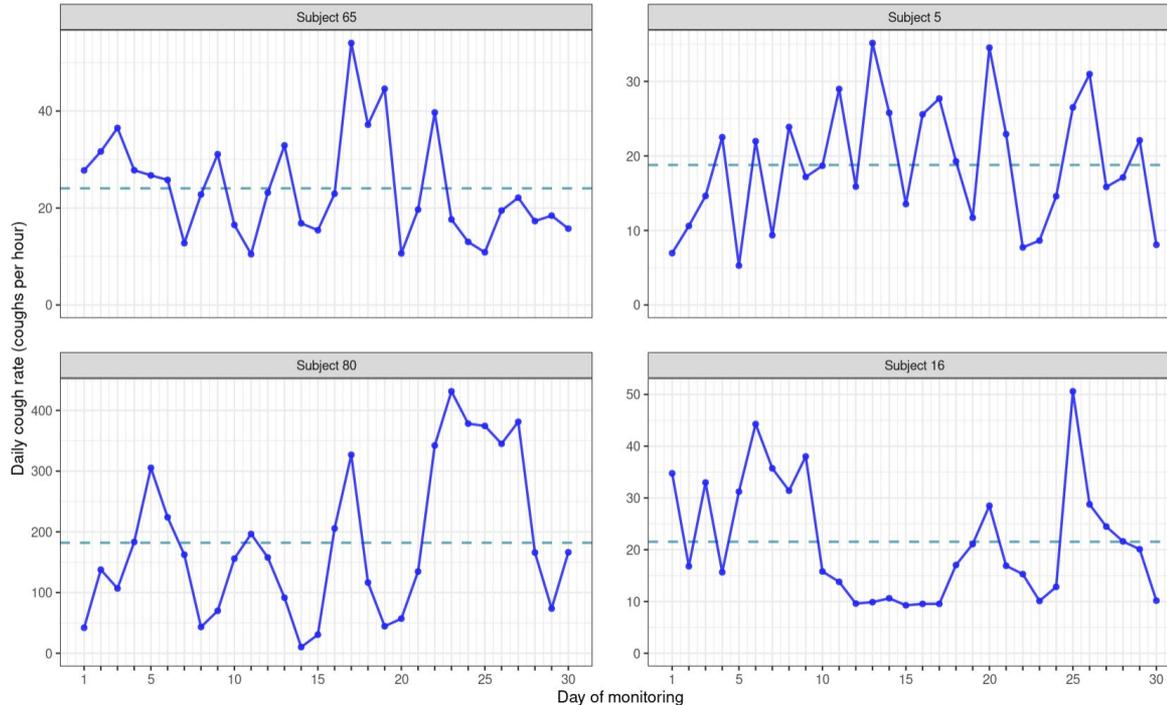
30 days of data from 4 problematic coughers, with 20+ hours of monitoring per day

These stable coughers have consistent daily cough rates (in blue) that vary predictably about their average rates (dashed lines)

These means define their baseline rates well

4. Cough Variability

Daily cough rates can be volatile, so mean cough rates do a poor job of predicting any single day's rate for many coughers.



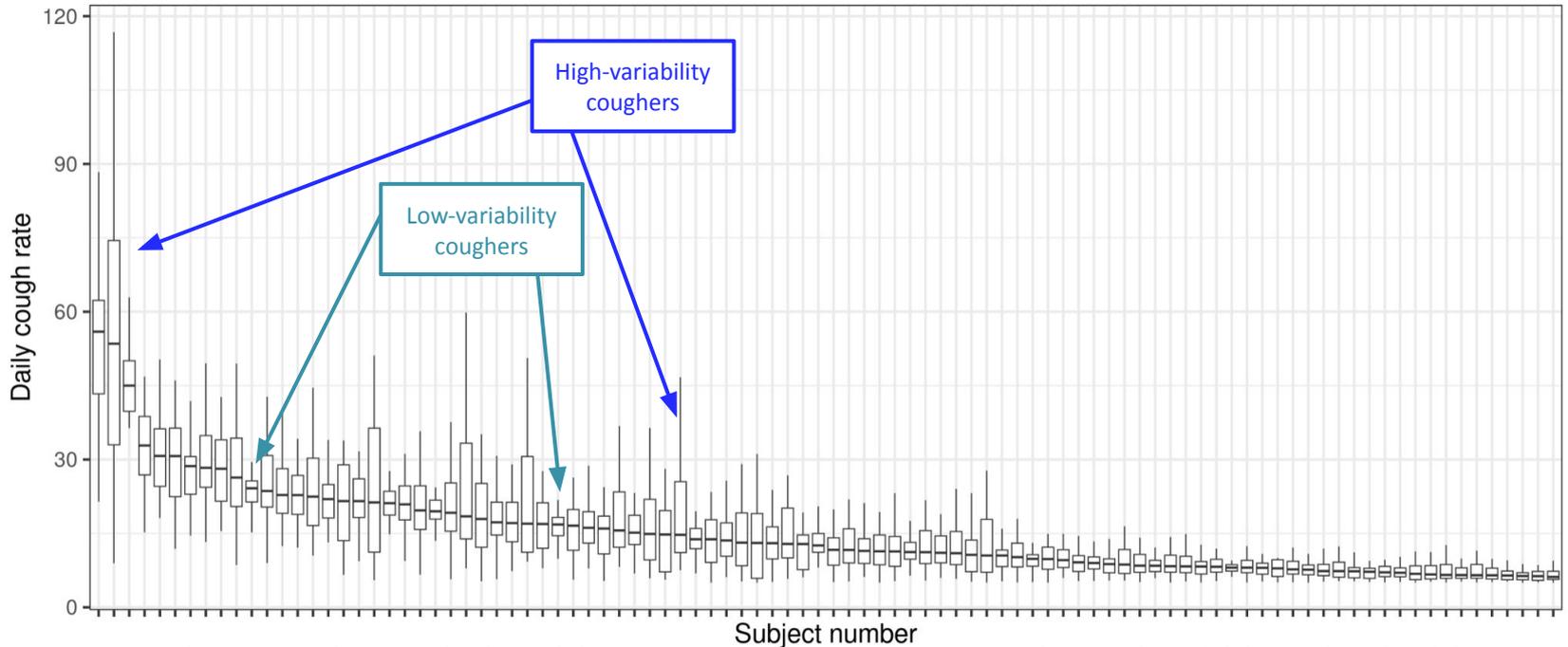
30 days of data from 4 problematic coughers, with 20+ hours of monitoring per day

These volatile coughers have inconsistent daily cough rates (in blue) that vary unpredictably about their average rates (dashed lines)

These averages don't describe their coughing well – these coughers don't have stable baseline rates

4. Cough Variability

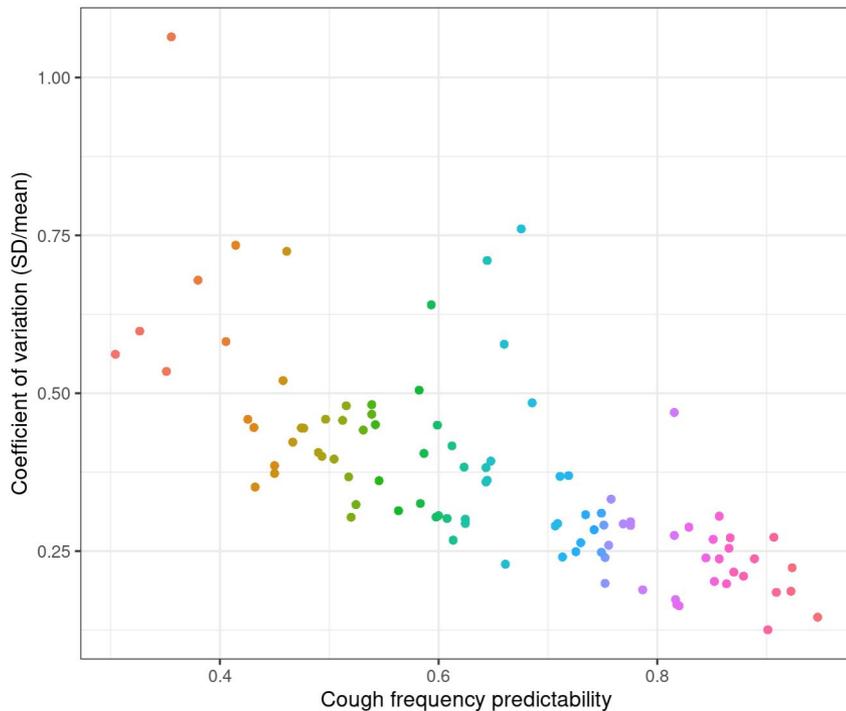
High degree of cough rate variability within and between individual coughers



Chung KF, et al. Longitudinal cough frequency monitoring in persistent coughers: Daily Variability and Predictability. Lung. 2024

5. Cough predictability

Monitoring for at least 2 weeks identifies **predictable coughers**



30 days of data from 97 problematic coughers, with 20+ hours of monitoring per day

Bottom right: predictable cough patterns, low variability

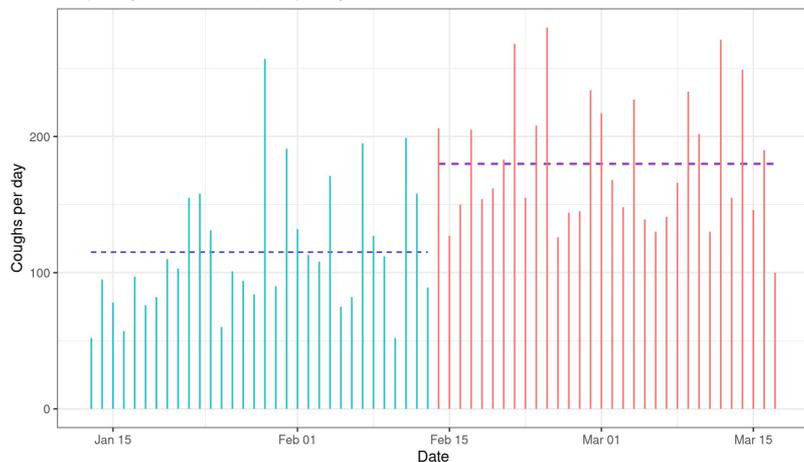
Upper left: unpredictable cough patterns, high variability

2 weeks of data yield good estimates of variability (CV), hence good estimates of predictability. Not possible with only one day of monitoring

6. Treatment response: Change point detection

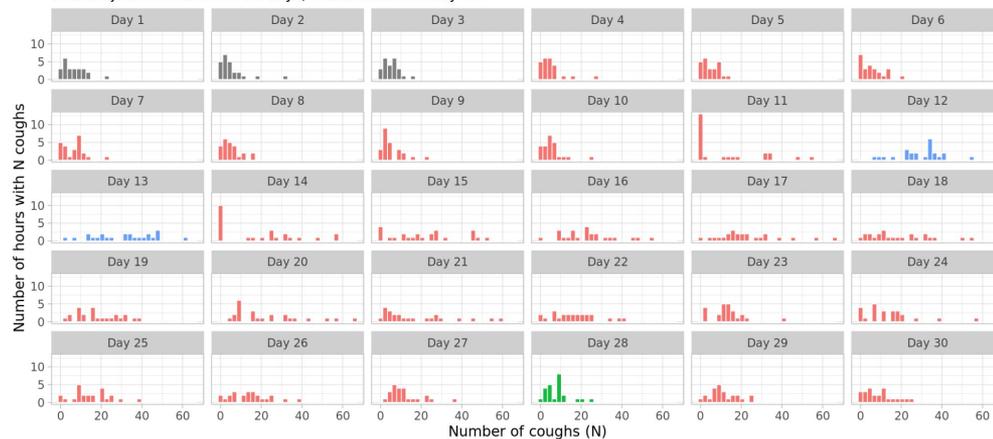
Continuous monitoring enables *retrospective* and *real-time* change detection.

Change in daily cough counts for an RCC patient (2 months of monitoring)
115 per day before Feb 14th ; 180 per day thereafter



Hourly cough count distributions by day

One subject monitored for 30 days; exacerbation on day 12

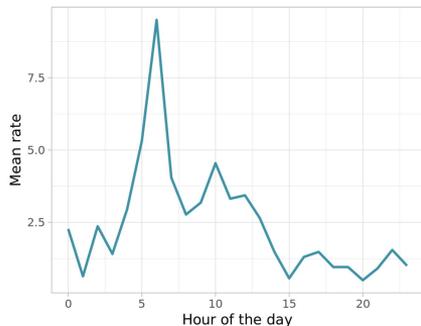


Evidence of change versus previous 3 days ■ None ■ Strong ■ Very strong ■ NA

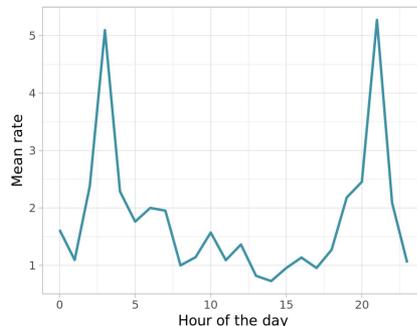


7. Diurnal patterns

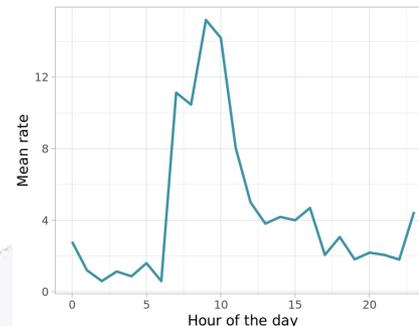
Longitudinal measurements reveal higher/lower cough rates that are linked to times of the day or night.



Significant increase in coughing after waking, followed by a steady decrease throughout the day



Increased coughing early and late in the day, with low cough rates in between



Significantly increased coughing mid-morning, followed by a steady decrease

Thanks to several weeks of reliable monitoring, we can see how these 3 subjects cough on average during each hour of the day

**Powerful insight examples from
continuous cough monitoring across
therapeutic areas**

Cough Is Increasingly Understood In COPD

Dominant symptom

>70% of patients report cough and it is one of the three cardinal symptoms.

Chronic cough is **associated with severe** exacerbations.

Cough is an **early feature of COPD** which helps identify patients at risk of progressive disease.

Chronic Obstructive Pulmonary Diseases:
Journal of the COPD Foundation 

▶ Chronic Obstr Pulm Dis. 2020 Jan 17;7(1):49–59. doi: [10.15326/jcopdf.7.1.2019.0146](https://doi.org/10.15326/jcopdf.7.1.2019.0146)

The Burden of Cough and Phlegm in People With COPD: A COPD Patient-Powered Research Network Study

[Radmila Choate](#)^{1,2}, [Cara B Pasquale](#)¹, [Nereida A Parada](#)³, [Valentin Prieto-Centurion](#)⁴, [Richard A Mularski](#)⁵, [Barbara P Yawn](#)¹

Predicts exacerbations

Almost half of acute COPD exacerbations can be **predicted** > 3 days in advance by cough monitoring at home.

 CHEST[®] JOURNAL

Cough and Sputum Production Are Associated With Frequent Exacerbations and Hospitalizations in COPD Subjects

[Pierre-Régis Burgel, MD, PhD](#)^{2,6}  [Pascale Nesme-Meyer, MD](#)³ · [Pascal Chanez, MD, PhD](#)⁶ · [Denis Caillaud, MD](#)⁴ · [Philippe Carré, MD](#)⁶ · [Thierry Perez, MD](#)¹ · [Nicolas Rache, MD, PhD](#)⁹ · on behalf of the Initiatives Bronchopneumopathie Chronique Obstructive (BPCO) Scientific Committee[†] Show less

[Lung](#). 2021; 199(2): 131–137. Published online 2021 Apr 7. doi: [10.1007/s00408-021-00435-9](https://doi.org/10.1007/s00408-021-00435-9)

PMCID: PMC8053154 | PMID: [33829322](https://pubmed.ncbi.nlm.nih.gov/33829322/)

Domiciliary Cough Monitoring for the Prediction of COPD Exacerbations

[Michael G. Crooks](#)^{2,1,3} [Albertus C. den Brinker](#)², [Susannah Thackray-Nocera](#)¹, [Ralph van Dinter](#)² [Caroline E. Wright](#)¹ and [Alyn H. Morice](#)¹

Cough Is increasingly understood in IPF

Dominant symptom

In FDA's patient interviews – **coughing** was mentioned by over **3/4 of participants** as being **one of their most significant symptoms**.

Over 80% of patients with **IPF complain of cough**.

Cough is **highly variable** in pulmonary fibrosis.

Predicts disease severity & mortality

Worse cough severity is associated with **worse** health-related **QoL**, disease **progression**, reduced transplant-free **survival** and **mortality**.

CLINICAL RESEARCH STUDY

THE AMERICAN JOURNAL of MEDICINE

Decoding objective cough features in progressive pulmonary fibrosis: A 6-month feasibility study

Michael D. Feist, MSc,^{1,2} Yiming Huang, MD,^{1,3} Meena Kalluri, MD,³ Janis Cole, RN,⁴ Esmatullah Naikyar, MBA,⁴ Pierre Boulanger, PhD, Eng,⁴ Umberto Zanini, MD,⁵ Surinder Birring, MD,⁵ Giovanni Ferrara, MD, PhD^{6,7}

The Voice of the Patient

A series of reports from the U.S. Food and Drug Administration's (FDA's) Patient-Focused Drug Development Initiative

> Curr Opin Pulm Med. 2024 Jun 25. doi: 10.1097/MCP.0000000000001087. Online ahead of print.

What causes cough in pulmonary fibrosis, and how should we treat it?

Katherine J Myall^{1,2}, Peter S P Cho^{1,2}, Surinder Birring^{1,2}

THE LANCET
Respiratory Medicine

Cough in idiopathic pulmonary fibrosis: more than just a nuisance

Christine L Vigeland • Maureen R Horton

Published: June 23, 2016 • DOI: [https://doi.org/10.1016/S2213-2600\(16\)30150-3](https://doi.org/10.1016/S2213-2600(16)30150-3)

American Journal of Respiratory and Critical Care Medicine

Home > American Journal of Respiratory and Critical Care Medicine > List of Issues > Just Accepted

Epidemiology and Prognostic Significance of Cough in Fibrotic Interstitial Lung Disease

Yeh H Khor, Kerri A Johansson, Veronica Marcoux, Jolene H Fisher, Deborah Assayag, Helene Manganas, Nasreen Khallil, Martin Kolb, Christopher J Ryerson, and the CARE-PF Investigators

Official Journal of the Asian Pacific Society of Respiriology

Respirology

Free Access

Cough predicts prognosis in idiopathic pulmonary fibrosis

CHRISTOPHER J. RYERSON, MARTA ABBRITTI, BRETT LEY, BRETT M. ELICKER, KIRK D. JONES, HAROLD R. COLLARD

And cough may have a causal role in IPF disease progression

Cough Is Increasingly Understood In Asthma

Dominant symptom

Poor asthma control is associated with:

- Higher coughing
- Presence of nighttime cough
 - Lower QoL

Cough is **common** in asthma, **independent** of pulmonary function tests (PFTs) and **poorly captured** by existing methods.

Diagnosis and Management of Cough: ACCP Evidence-Based Clinical Practice Guidelines

Chronic Cough Due to Asthma: ACCP Evidence-Based Clinical Practice Guidelines

Peter V. Dicpinigaitis MD, FCCP  

Show more 

THE LANCET Respiratory Medicine

PERSONAL VIEW · Volume 11, Issue 7, P650-662, July 2023

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Cough and cough hypersensitivity as treatable traits of asthma

[Prof Kefang Lai, MD](#)^a · [Imran Satia, MD](#)^{b,c} · [Woo-Jung Song, MD](#)^d · [Prof Gang Wang, MD](#)^e · [Prof Akio Niimi, MD](#)^f · [Philip Pattermore, MD](#)^g
· [Prof Anne B Chang, PhD](#)^{h,i,j} · [Prof Peter G Gibson, MD](#)^k · [Prof Kian Fan Chung, DSc](#)^{l,m}   Show less

Predicts exacerbations

Cough monitoring might be used to **detect asthma exacerbations** 3–5 days in advance.

> J Asthma Allergy. 2020 Dec 3;13:649–657. doi: 10.2147/JAA.S278119. eCollection 2020.

Characteristics of Asthma-related Nocturnal Cough: A Potential New Digital Biomarker

Frank Rassouli ^{# 1}, Peter Tinschert ^{# 2}, Filipe Barata ³, Claudia Steurer-Stey ^{4 5}, Elgar Fleisch ^{2 3}, Milo Alan Puhan ⁴, Florent Baty ¹, Tobias Kowatsch ^{2 3}, Martin Hugo Brutsche ¹

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'The Very Breathless Caterpillar' – Paediatric diagnostics

S87 Contactless and automated monitoring to study changes in nocturnal parameters before and after asthma attacks in children

P Nagakumar ¹, W Do ², O Carr ², M Udani ², L Fleming ³, S Saglani ⁴

Cough Is Increasingly Understood In

Oncology

Drug-Induced Lung Damage

Up to 55% of chemotherapy drugs result in **drug-induced interstitial lung disease (DI-ILD)**

DI-ILD has a 2 year average time to diagnosis reported in the literature, and **very high mortality** (severity of DI-ILD at diagnosis predicts the mortality).

Early detection of DI-ILD via cough monitoring in patients beginning chemotherapy could prompt early evaluation and result in better quality of life, and prognosis.

▶ J Clin Med. 2018 Oct 15;7(10):356. doi: [10.3390/jcm7100356](https://doi.org/10.3390/jcm7100356)

Drug-Induced Interstitial Lung Disease: A Systematic Review

Sarah Skeoch^{1,2}, Nicholas Weatherley³, Andrew J Swift³, Alexander Oldroyd¹, Christopher Johns³, Conal Hayton⁴, Alessandro Giollo^{5,6}, James M Wild³, John C Waterton^{7,8}, Maya Buch⁵, Kim Linton⁹, Ian N Bruce^{1,10}, Colm Leonard⁴, Stephen Bianchi¹¹, Nazia Chaudhuri⁴.

Lung Cancer

Over 60% of **lung cancer patients cough**, and in the literature, cough is described as an **under-researched and under-treated symptom**.

Cough (and worsening of cough) is an **early indicator of pneumonitis**, an adverse effect of radiotherapy (standard of care for ~50% of lung cancer patients), but one that is often missed at early stages.

▶ Cancers (Basel). 2023 Jan 4;15(2):326. doi: [10.3390/cancers15020326](https://doi.org/10.3390/cancers15020326)

Early Identification of Pneumonitis in Patients Irradiated for Lung Cancer –Final Results of the PARALUC Trial

Dirk Rades^{1*}, Elisa M Werner¹, Esther Glatzel¹, Sabine Bohnet², Steven E Schild³, Søren S Tvilsted⁴, Stefan Janssen^{1,5}

▶ Chest. 2017 Jan 17;151(4):861-874. doi: [10.1016/j.chest.2016.12.028](https://doi.org/10.1016/j.chest.2016.12.028)

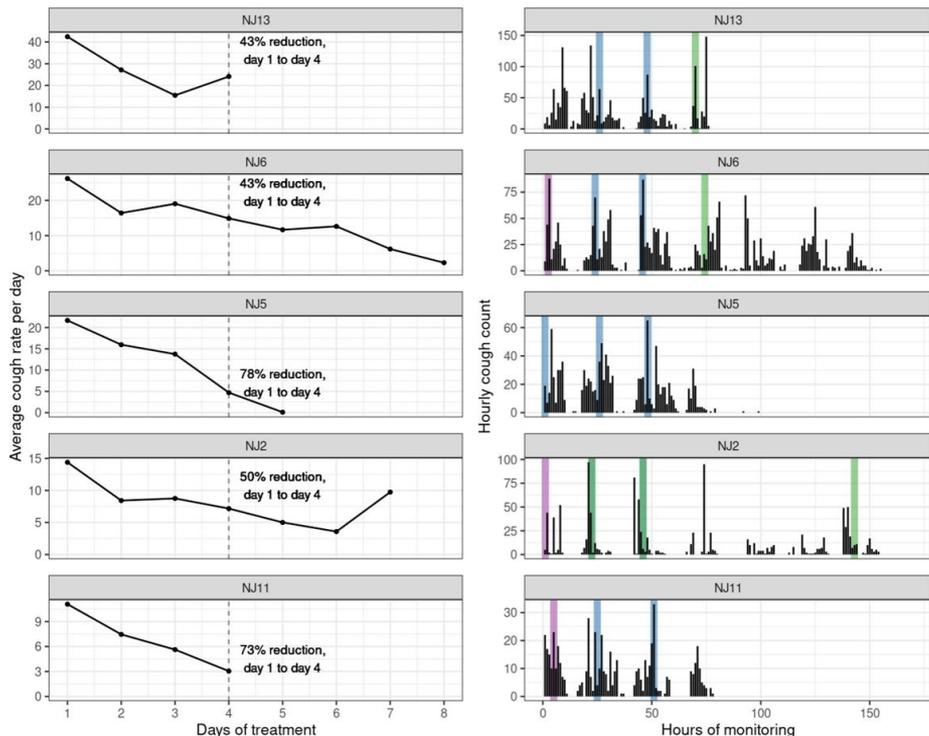
Symptomatic Treatment of Cough Among Adult Patients With Lung Cancer

CHEST Guideline and Expert Panel Report

Alex Molassiotis^{3a*}, Jaclyn A Smith^b, Peter Mazzone^c, Fiona Blackhall^d, Richard S Irwin^e; CHEST Expert Cough Panel, on behalf of the

Cough's importance in other therapeutic areas

Bronchiectasis



Cough as:

- A biomarker of treatment response
- An early detection of exacerbation
- A data-stream driving adherence to, e.g., airway clearance treatment protocols
- A data-stream for personalizing treatment

Left panel: daily average of hourly cough counts.

Right panel, the timing of cough inducing interventions including:

- Hypertonic saline sputum induction,
- OPEP combined with hypertonic saline,
- High Frequency Chest Wall Oscillation trials.

Griffith DE, et al. Using Continuous Cough Monitoring to Assess Bronchiectasis Therapy. *Am J Respir Crit Care Med* 2024

Cough is the most important symptom in bronchiectasis (1/3)

1. **Cough is the most common symptom of bronchiectasis, experienced by 22% of 1600 patients.**

Patients' perspectives on bronchiectasis: findings from a social media listening study, Delestre Levai et al, ERJ, 2021 ([link](#))

Based on 1600 total mentions of bronchiectasis symptoms, persistent **cough**, shortness of breath and mucus production (22%, 20% and 18% of mentions, respectively) were found to be the most commonly discussed symptoms among patients online. Shortness of breath was

2. **Providers and patients identify productive cough as the most impactful symptom of bronchiectasis.**

Patient- and physician-reported symptom burden among patients with bronchiectasis in Europe, Sommerweck et al, Thorax, 2025 ([link](#))

Among patients, 87.8% reported medium-to-very high impact of symptoms based on CAAT scores; the highest impact symptoms were **cough**, mucus and breathlessness. Despite being rated as mild by physicians, 85.6% of patients reported that symptoms had

3. **Cough is a common and significant symptom in patients with bronchiectasis. ([Spinou A et al. Lung 2017](#)) Cough in bronchiectasis is associated with significant impairment in health-related quality of life. ([Murray MP et al. ERJ 2009](#))**

Cough is the most important symptom in bronchiectasis (2/3)

Objective cough count in bronchiectasis patients is reproducible and relates to quality of life, ERS, 2019 ([link](#))

Even in a small number of subjects objective daytime cough count was reproducible and appeared to be related closely to sputum weight and quality of life. In contrast to night time cough which had little relationship. Day time cough frequency has the potential to be a useful marker of disease status in bronchiectasis.

“The missing ingredient”: the patient perspective of health related quality of life in bronchiectasis: a qualitative study, BMC Pulmonary Medicine, 2018 ([link](#))

Theme 1: Symptom burden

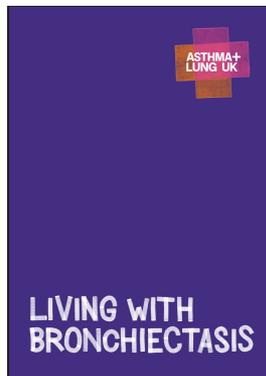
A combination of cough, breathlessness and sputum production was present in all participants although the relative importance of each of these symptoms was highly variable when describing the impact on their quality of life.

Cough is the most important symptom in bronchiectasis (3/3)

Educational materials from patient-groups and healthcare systems around the world all emphasize cough burden



“The common symptoms of bronchiectasis are having a cough that is hard to get rid of...”



Cough is top choice on symptom diary
“The most common symptom is a long-term cough”

 Temple Health

Doctors

Home > About Temple Health > Blog > 5 Things You Should Know About Bronchiectasis

5 Things You Should Know About Bronchiectasis

“Constant congestion and coughing is uncomfortable, and can make it hard to sleep through the night. Additionally, some of my patients tell me that they feel embarrassed from coughing frequently while in public.”

Cough's importance in other therapeutic areas

Congestive Heart Failure (CHF)

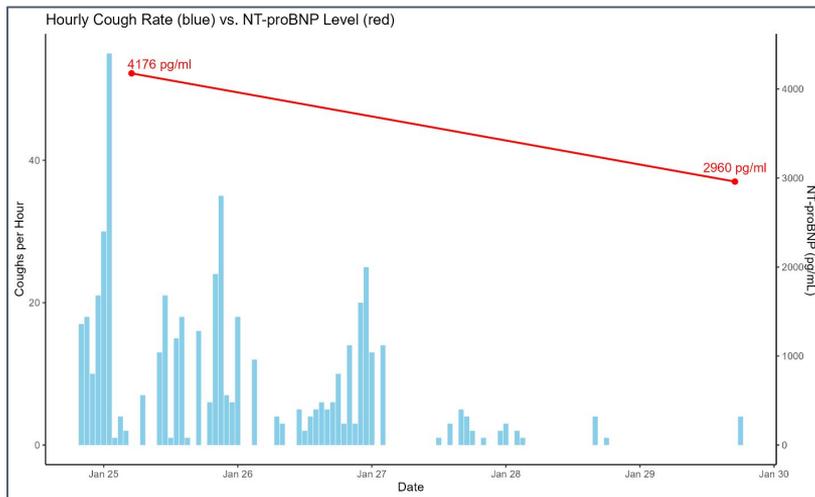
Hourly cough rate vs a blood biomarker (NT-proBNP) in a patient with acute decompensation in heart failure.



Cough might be:

1. An early biomarker of decompensation in congestive heart failure
2. Treatment response biomarker

Each 1 cough/hr decrease was associated with 95.03 pg/ml decrease in NT-proBNP.



Unpublished data: Matthew E. Lassman, George Perlman, Natalie Gendron, Nadia Giannetti (2024)

Cough's importance in other therapeutic areas

Gastroesophageal reflux disease (GERD)

Coughing after eating is a well-established symptom of GERD.

Postprandial cough-monitoring and cough dynamics might be a simple, noninvasive differential diagnostic and treatment response biomarker.

Cystic Fibrosis (CF)

Cystic fibrosis patients cough significantly more than healthy subjects.

Cough in CF occurs mainly in the 1st and 2nd quarter of the night and correlates with parameters of disease severity (FEV1% and Immunoglobulin G).

Cough has been identified as a significant and early symptom of pulmonary exacerbations in cystic fibrosis.

Cough is both psychologically and physically a present symptom in CF patients and has influence on everyday life of the patients.

Cough's importance in other therapeutic areas

Tuberculosis (TB)

Cough is the cardinal symptom of TB and is of prime importance in transmission.

Cough-monitoring can predict clinical outcome for patients receiving empiric treatment and monitor for relapse.

Non-Tuberculous Mycobacteria (NTM)

Cough is common in NTM patients and provides objective evidence for making complicated therapeutic decisions.

Cough is a common adverse effect of inhaled therapies (e.g. Arikace) and its quantification can assist in treatment management.

Cough's importance in other therapeutic areas

Pulmonary sarcoidosis

Cough is an extremely common symptom of Sarcoidosis, and cough monitoring might improve diagnosis, management and outcomes of treatment.

Cough is the most common pulmonary symptom in exacerbations of pulmonary sarcoidosis.

Angiotensin-converting enzyme (ACE) inhibitors caused cough

Cough is a very common side-effect of ACEi.

The development of a dry cough can significantly decrease patient adherence to ACEi therapy.

Earlier medication plan review could be prompted via continuous cough monitoring.

What's next?



View Hyfe's scientific publications [here](#).



Email peter@hyfe.com (Chief Medical Officer) to discuss ideas and plan your study.



#Appendix

CoughPro: Hyfe's Consumer Wellness App for Smartphones (Android & iOS)

- Available globally**
- Free**

CoughPro : available on app stores



- Wellness App to help subjects live better with their chronic cough and have more informed conversations with their providers
- Not for diagnosing or managing disease
- 100k+ registered users globally
- Passive continuous privacy-preserving cough monitoring
- Cough triggers
- Personal Cough Report (available as PDF for sharing)

Globally available on every iOS and Android smartphone

CoughPro insights - available on every smartphone

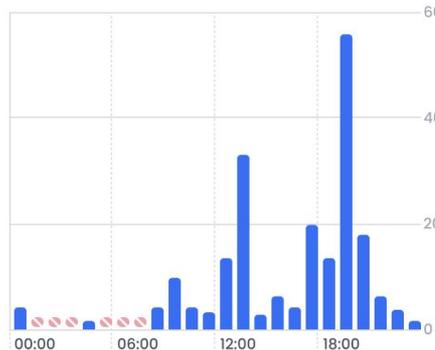
Cough counts

Hourly Daily Weekly Monthly

COUGHS TODAY

201

Wednesday, 12 Apr 2023



Time tracked & cough rate

Daily Weekly Monthly

TIME TRACKED IN THE LAST 24HRS

18 hrs 54 min /24 hrs

COUGH RATE TODAY

8.9/hr



DAILY COUGH RATE HISTORY

Yesterday	9.1/hr
10 Apr 2023	did not track
9 Apr 2023	8.8/hr
8 Apr 2023	9.0/hr

Cough trend

Daily Weekly Monthly

Last 24h compared to the last 4 days

COUGH TREND

Lower



Cough bursts

Daily Weekly Monthly

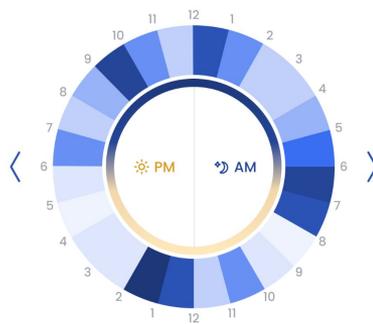
Wed, 9 Apr 2023

BURSTS TOTAL

38

PEAK HOUR

1 - 2pm



BURST QUANTITY



CoughPro is Hyfe's smartphone-based wellness app, which runs passively and continuously in the background in a privacy preserving way.

CoughPro (<https://coughpro.com/>)