

Good Asthma Self Care Is Vital. Why Is Encouraging It So Difficult?

April 17, 2019

The numbers are striking: An estimated **30 million people in the EU** currently live with **asthma**. Between 1.5-2.1 million have the most severe form of the condition. Each year 15,000 Europeans die from asthma attacks (four die every day in the UK alone¹), half a million are hospitalised. Awareness in Europe is high; and of the 20 countries in the world reporting the highest asthma prevalence in adults, 14 are in the EU. **Within the EU** millions of working days are lost each year and **total annual costs** are estimated at **€79Bn** (US\$89Bn).

What is Good Asthma Self Care?

A typical medication regime is two-pronged: daily doses of anti-inflammatory corticosteroids treat the underlying condition, beta2 adrenergic agonists relieve acute symptoms.

Effective asthma self-care relies on the **right medications** being used at the **right time** and at the **right dose** and administered correctly. A number of studies have found that the administration of medication is unsatisfactory², fails to comply with care plans and that patients underuse their medication³.

The severity of a sufferer's asthma is not constant. It naturally becomes worse during viral or bacterial respiratory infections. It may be better or worse depending on the weather, atmospheric or environmental pollution. It will vary significantly from patient to patient and for individual patients over time. Patients also react differently to different triggers, such as exercise, and their response to different medications varies. The medication regime needs to be adjusted accordingly and must be adhered to correctly.

According to GINA⁴ guidelines asthma self-care should follow a plan, tailored to a patient's specific needs, that has been devised by and agreed with their treating medical professional. This should set out clear steps for management and responses to changes in the patient's condition.

The Finnish Asthma Programme Experience

From 1994-2004 Finland ran a National Asthma Programme. During the period 1987-2015 the number of asthma patients with persistent asthma listed in the national drug reimbursement register rose from 83,000 to 256,000. Yet, between 1993 and 2013 the total cost of care fell by 42% from €330M⁵ to €191M. Through medication and primary care visit costs rose, the annual average cost per patient fell by 72%, from €2656 to €749.⁶

¹<https://www.theguardian.com/environment/2018/jul/18/asthma-deaths-rise-25-amid-growing-air-pollution-crisis>

² Baiardini I, Braido F, Bonini M, Compalati E, Canonica GW. Why do doctors and patients not follow guidelines? *Curr Opin Allergy Clin Immunol*. 2009 Jun;9(3):228-33

³ Slejko JF, Ghushchyan VH, Sucher B, et al. Asthma control in the United States, 2008-2010: indicators of poor asthma control. *J Allergy Clin Immunol* 2014; 133:1579-1587.

⁴ Global Initiative for Asthma

⁵ www.thelancet.com/respiratory Vol/ March 2019

⁶ Haahela T, Herse F, Karjalainen J, Klaukka T, Linna M, Leskelä RL, Selroos O, Reissell E. The Finnish experience to save asthma costs by improving care in 1987-2013.

“These changes were achieved through systematic planning, education and networking to implement early detection and anti-inflammatory treatment (mainly ICSs) at all levels of asthma care.”⁷

Why is Asthma Self-Care so Difficult for Many Patients?

There are five main reasons asthma patients struggle to provide good self-care:

- It's hard to measure lung condition and know when to act without constant trips to the doctor.
- Patients come to rely on medicines that give immediate relief to severe symptoms and neglect long term care.
- Some patients underuse their medication through fear of possible side-effects, though these are, in practice, rare.
- It's hard to ensure that the daily medication dose is optimal and taken correctly.
- External events can cause sudden changes in the condition.

Asthma is a chronic condition in which there is increased sensitivity to stimuli that narrow the airways (bronchial hyperresponsiveness), epithelial inflammatory changes and excessive mucus formation. They lead to episodic or prolonged airway obstruction. Preventing the basic inflammatory changes requires daily, long-term treatment, typically with corticosteroids delivered via an inhaler (Inhaled Corticosteroids or 'ICS', often referred to as treatment medication). Asthma sufferers typically do not notice when their lung health deteriorates slowly. They usually have far more lung capacity than they need for daily life. Because of the slow nature of the deterioration patients often neglect to take their daily ICS medication. Instead they react when they start having breathing difficulties by taking beta2 agonists (BA) for immediate relief (commonly called reliever medication). Beta2 agonists are used to open up the airways quickly in the event of an asthma attack. With reliever medication patients are alleviating the immediate condition but forgetting to treat the basic condition with corticosteroids (ICS) that take hours or days to reach their full effect.

Too often adherence to medication is poor. Compliance can be as low as 20% but is rarely higher than 70%.^{8, 9} In young adults adherence has been found to be between 20-35%.¹⁰

KAMU Asthma[®] Reduces Uncertainty and Aims to Increase Symptom-Free Days

KAMU[®] offers an easy-to-use combination of a smartphone app, KAMU Asthma, and a spirometer, KAMU Spiro[™], linked to it. The service is simple and intuitive to use. It reminds patients to test regularly, and if a test wasn't conducted correctly it gives the reason, in order to encourage higher-quality, more uniform testing, more reliable data, better analysis and, ultimately, better outcomes.

The CE-Medical-Device-Class-IIa and FDA-certified KAMU Spiro has its own processor and display for stand-alone use. It self-calibrates to the environment, and measures FEV₁, FEV₆, and FVC in addition

⁷ Ibid.

⁸ Krishnan JA, Bender BG, Wamboldt FS, Szeffler SJ, Adkinson NF, Jr., Zeiger RS et al. Adherence to inhaled corticosteroids: an ancillary study of the Childhood Asthma Management Program clinical trial. *Journal of Allergy and Clinical Immunology*. 2012; 129(1):112-118

⁹ Szeffler SJ. Monitoring and adherence in asthma management. *The Lancet Respiratory Medicine*. 2015; 3(3):175-176

¹⁰ Bender BG, Rankin A, Tran ZV, Wamboldt FS. Brief-interval telephone surveys of medication adherence and asthma symptoms in the Childhood Asthma Management Program Continuation Study. *Annals of Allergy, Asthma, and Immunology*. 2008; 101(4):382-386

to ambient environment details. It fulfils American Thoracic Society and European Respiratory Society criteria for lung function testing.

The device has a built-in lithium battery and the instrument is designed to maximize patient engagement.

KAMU Asthma Features

- Helps to track and manage lung condition.
- Reports with well-visualized data make it easy to share information. It promotes communication with healthcare professionals and also with friends or family members.
- Accounts for a wide range of external factors and triggers that can affect patients' symptoms.
- The app reminds users to test themselves.
- Offers personalized and customizable medication reminders and a simple way to log medication use.
- Provides an easy way to log symptoms together with a regular questionnaire to track the condition.
- Provides personalized asthma forecasts and alerts.
- KAMU Spiro is CE-Medical-Device-Class-IIa and FDA-certified.
- KAMU Asthma smartphone app is a CE Class I medical device.
- KAMU Benchmark – compares an individual's lung performance with the performance of other KAMU users.

Tracking symptoms and adherence to medication

KAMU Asthma makes it easy for patients to track and manage their own conditions and to share the data. The data that KAMU collects gives medical professionals an empirical basis for better diagnosis, prescription and predictive patient care. It also accounts for a wide range of external factors and triggers that can affect patients' symptoms.

The app reminds users to test themselves and to log medication use and symptoms. Studies suggest that the results of such reminders are positive.^{11, 12} Usage trends are clearly displayed so the patients can see, at a glance, how well they are following their care plan and how their adherence to their medication regimen affects their lung condition.

KAMU Asthma also offers patients an easy way to log their symptoms using a regular questionnaire designed to help track their condition. This data is compiled into a total wellbeing index that gives a long-term, trackable score indicating whether the patient's health is improving or deteriorating and gives healthcare professionals and users another source of actionable data.

An EU-funded EARIP study concluded patients and care professionals see communication difficulties and the lack of data as the most significant barrier to better patient care¹². KAMU provides this data as a solid basis for better care and communication. Users both own and control any data in which they are personally identified.

¹¹ Nina Johnston MD, PhD Johan Bodegard MD, PhD Susanna Jerström et al. Effects of interactive patient smartphone support app on drug adherence and lifestyle changes in myocardial infarction patients: A randomized study

¹² Svendsen MT, Andersen F, Andersen KH, Pottegård A, Johannessen H, Möller S, August B, Feldman SR Andersen KE. A smartphone application supporting patients with psoriasis improves adherence to topical treatment: a randomized controlled trial.

Studies have consistently shown that patients who actively monitor their own conditions have better outcomes than those who don't. "...the results suggest that routine self-tracking, as opposed to occasional, event-triggered tracking, is more likely to result in positive changes to health management approaches"¹³.

Personalized Asthma Forecasts

The KAMU Analytics Engine also collates health data and tracks air quality, so users can check weather conditions locally or in locations to which they may travel.

The engine also tracks and displays available data for PM2.5, PM10, NO, NO₂, CO, O₃ and SO₂ levels and matches those to users' symptoms. Its predictive features allow alerts to be sent to users and, in time, machine learning will make these more accurate and personalized, emphasising links between external factors and asthma and encouraging better treatment adherence.

KAMU will also enable users to benchmark their own condition and performance against various parameters like location, age, gender, and other physiological parameters.

Appendix

Monitoring Lung Condition: Spirometry vs PEF

Devices for monitoring lung condition at home typically measure either FEV₁¹⁴ or PEF¹⁵; peak expiratory flow. Doctors and the GINA (Global Initiative for Asthma) prefer FEV₁ spirometry over PEF as spirometry describes the details of ventilation and is often diagnostic.

PEF meters are inexpensive but less accurate and patients have to measure their airflow multiple times and work out an average. Many find this difficult to adhere to and rely on 'gut instinct' instead.

The advantage of FEV₁ spirometry devices is that the repeatability of the tests is significantly better than with PEF devices – the coefficient of variation with the former is 6% against 12% with PEF devices.

FEV₁ values are less erratic than PEF results. Worsening of lung function is easier to detect before the patient exhibits clear symptoms. Medication can be appropriately adjusted and, if needed, medical appointments made.

About KAMU

KAMU Health Ltd develops and markets digital therapeutics for respiratory-illness care. Through technology, KAMU provides users and their healthcare providers with better data to support treatment while empowering users to take a proactive role in managing their conditions. All KAMU's services are founded on the latest evidence-based medicine and comply with local medical regulations in the US and Europe. www.kamuhealth.com

¹³ Mayara Figueiredo, Clara Caldeira, Yunan Chen, and Kai Zheng Routine self-tracking of health: reasons, facilitating factors, and the potential impact on health management practices AMIA Annu Symp Proc. 2017; 2017: 706-714. PMID: 29854136

¹² Andrew J. Simpson, Persijn J. Honkoop, Erika Kennington et al. Perspectives of patients and healthcare professionals on mHealth for asthma self-management European Respiratory Journal 2017 49: 1601966; DOI: 10.1183/13993003.01966-2016

¹⁴ FEV₁ (forced expiratory volume in one second) is the proportion of a person's full, forced [vital capacity](#) (FVC) that they are able to expire in the first second of forced expiration ([FEV₁](#))

¹⁵ PEF (peak expiratory flow)