

# Asthma Control: Adoption of Novel E-devices

David Selvaggio\*

Department of Pulmonology, Saint Camillus International University of Health Sciences, Rome, Italy

## Abstract

**Background:** Although inhaled corticosteroids and long-acting  $\beta$ 2-agonists are well-established as the cornerstone of asthma treatment, patient adherence has been consistently shown to be suboptimal. In fact, non-adherence has a negative impact on asthma control, patient quality of life and therapy cost effectiveness. Non-adherence to prescribed treatments appears to be a mostly predominant phenomenon in the asthma population, sensibly limiting patients' quality of life, and negatively impacting on the overall sustainability of healthcare systems. Electronic devices can reasonably improve patient's adherence to treatments by providing regular reminders and motivational messages. Moreover, they can collect real-life data on drug usage to retrieve possible patterns associated with increased compliance.

**Objective:** The Turbu+™ program aims at collecting daily real-life data of drug usage inhaled doses to estimate treatment adherence to Symbicort® (budesonide, formoterol) Turbuhaler®. Additionally, the program can serve to identify possible patterns of medication usage.

**Methods:** A total of 497 asthma patients were included in the analysis. Patients were prescribed Symbicort® maintenance therapy or Symbicort® Maintenance and on-demand Anti-inflammatory Reliever Therapy (referred as SMART approach). Treatment adherence was measured every 30 days and calculated over a 360 days follow-up window of time since the recruitment of the patient in the program.

**Results:** The average medication adherence with the use of Turbu+™ e-device was assessed as 65.9% over the entire follow-up time. Adherence was significantly increased when Symbicort® was associated with prescribed as on-demand Anti-inflammatory Reliever Therapy (SMART approach).

**Conclusion:** Our evaluation these observations may highlight an overall incrementation of asthma treatment adherence with the utilization of the Turbu+™ e-device as compared with literature. Asthma patients appear to be more compliant with SMART approaches, reflecting a likely improved control over different types of symptoms compared to other therapeutic options.

**Keywords:** Asthma • E-devices • Adherence • SMART approach

## Introduction

Asthma, a disease affecting almost 35 million individuals in Europe and the United States, can today benefit from a multitude of effective therapies granting an improved life expectancy as compared with the past [1,2]. Taking into account asthma heterogeneous clinical manifestations, ranging from mild to severe forms, chronic pharmacotherapy is recommended by international guidelines to maintain satisfactory disease control and thereby to grant reach optimal asthma management [3-5].

However, several factors are known to impact negatively on overall disease control, mainly arising as a direct consequence of patient's reduced adherence to treatments. As documented in the literature, the quality of asthma management is still suboptimal and shows large improvement margins [6-8]. Non-adherence to prescribed medications can be due to the patient's deliberate choice or due to simple inattention or to poor inhalation technique. The phenomenon has been reported to range between 30%-70% of the total treated population, indicating a very low rate of compliant patients. On average, adherence rates worldwide have been estimated as 50% in several published studies [9-12]. In the majority of cases, reduced adherence can be the result of a lack of education and motivation, highlighting the need for improved communication between patients and clinicians [3].

\*Address for Correspondence: David Selvaggio, Department of Pulmonology, Saint Camillus International University of Health Sciences, Rome, Italy; Email: selvaggioid@gmail.com

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Uncontrolled asthma generated by treatment non-adherence is associated with a dramatic worsening of patient's quality of life. Moreover, it leads to an overall exacerbation of health care costs due to the need for rescue therapies, and increased exacerbations and hospitalization rates [9,13,14]. Thus, efforts directed towards the improvement of patient adherence to pharmacotherapies would not be only beneficial for patients, but also for the overall sustainability of healthcare systems [12,15].

In recent years, novel technologies comprising digital monitoring devices (or e-devices) have been coming of age with regards to multiple healthcare-related fields; e-devices can provide support for optimal medication use by providing regular reminders and motivational messages to patients, allowing the overall improvement of asthma control [16,17]. The integration of digital devices in real-life clinical practice can nonetheless provide a novel tool to collect quality data on drug usage and actual patient compliance with regards to prescribed treatments, ultimately supporting a patient-centric approach [16,18].

### Turbu+™ device

Among novel e-devices, the Turbu+™ program has been ideated to improve asthma management and to support therapeutic adherence to Symbicort® (budesonide, formoterol) Turbuhaler®. The device, thanks to the integrated Smart inhaler technology™, can effectively support adherence to therapy by push-notifying patients and by reminding them to self-medicate on time. The device can also provide motivational messages to the patients, a function that is particularly useful with regards to long-term, chronic treatments. Moreover, the Turbu+™ program effectively collects data concerning real-life drug usage, rendering it possible to retrieve an accurate snapshot of current patterns of use while discriminating between clinical outcomes resulting from poor response to therapies or missed inhalations. Patients enrolled in the Turbu+™ program can also upload information regarding symptoms possibly experienced during the day, a strongly desired function considering the significant heterogeneity of both patients' comorbidities and disease manifestations [4]. Real-life data collected by the Turbu+™ e-device can be accessed by both patients and

their treating clinicians and can support improved communication between the two parties, ultimately boosting disease awareness and the importance of regular inhalations adherence to prescribed therapies. Nevertheless, data collected by e-devices may allow for improved disease management in concert with health-economic perspectives evaluations [16].

## Methods

### Patient’s population

For the purpose of the present analysis, a total of 497 asthma patients were enrolled in the Turbu+ program by pulmonologists and allergists in public and private secondary care centers across Italy (Rome and Naples). All patients were prescribed Symbicort® maintenance therapy (223/497) or Symbicort® Maintenance and on-demand Anti-inflammatory Reliever Therapy (SMART approach, 274/497). Medication adherence was assessed every 30 days for a total follow-up of 360 days.

Each patient was provided a Turbu+™ device after proper training on its correct use. The device, after being securely attached to the inhaler and linked to a companion smartphone app, was thus able to notify patients about correct drug administration while collecting objective data regarding medication usage and therapeutic adherence. By connecting the Turbu+™ device to the inhaler and their smartphones, patients were able to view their actual Symbicort® use. This analysis was completed using data collected from users of V2.1 of the Turbu+™ program.

### Adherence calculation

Average medication adherence was defined as the proportion of daily maintenance inhalations taken as prescribed (number of actual maintenance inhalations per day/number of maintenance inhalations prescribed per day) and averaged over the monitoring period. Inhalations exceeding the daily prescribed puffs (referred to as on-demand inhalations) were not included in the present analysis. The standard deviation was calculated to determine the grade of data dispersion.

## Results

### Average medication adherence

Overall, average medication adherence ( $\pm$  standard deviation) over the entire follow-up period was calculated as 65.9% ( $\pm$  2.4). Although compliance tended to decrease after initial evaluation at day 30 (72.0%), patients were recorded to maintain treatment adherence over time, with the lowest value recorded at day 150 (63.3%) (Figure 1). Importantly, the evaluation of average medication adherence showed consistent trends over the total follow-up time. Average medication adherence was never recorded to drop below 63.3%, irrespectively from the type of received treatment. At the end of the observation time (day 360), average adherence resulted in being as high as 65.7%.

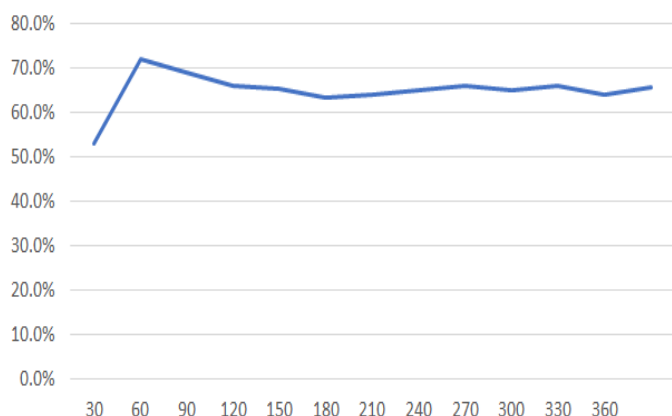


Figure 1. Average medication adherence.

### Drug usage patterns

As part of the present analysis, medication adherence has also been calculated by comparing two different therapeutic approaches: Symbicort® maintenance therapy (223/497 patients) versus Symbicort® Maintenance and on-demand Anti-inflammatory Reliever Therapy (SMART approach, 274/497). As shown in Figure 2, average medication adherence over the total follow-up time results to be superior with regards to patients undergoing SMART strategies (67.3%  $\pm$  0.0311%) as compared with non-SMART regimens (62.8%  $\pm$  0.063%). Although minor fluctuations have been recorded, adherence data are highly consistent over the entire follow-up time, as indicated by the low grade of dispersion. At the end of the observation time (day 360), adherence with SMART regimens was documented as 72%, whereas patients receiving non-SMART conventional maintenance treatments recorded a 55% adherence. Thus, these results can indicate increased compliance obtained when maintenance therapy is associated with on-demand corticosteroids.

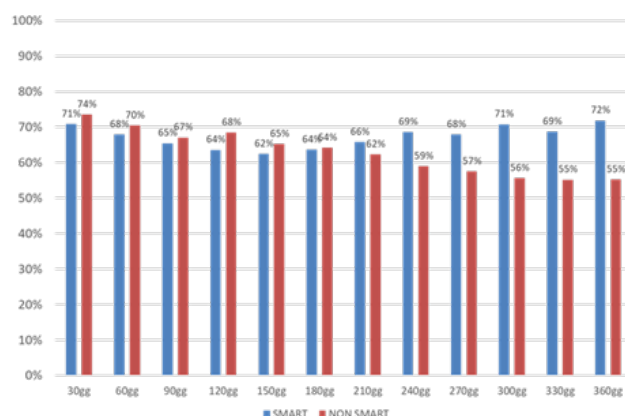


Figure 2. Comparison between treatment adherences with SMART approaches versus non-SMART regimens. Note: Blue: SMART; Red: Non SMART.

## Discussion

A growing number of published papers show how the adoption of novel e-devices can significantly improve the overall monitoring and treatment adherence in asthma. Thus, current efforts aimed at integrating digital devices in healthcare can support optimized disease management.

Our study displays an average medication adherence rate of 65.9% obtained with the integration of the Turbu+™ e-device in everyday self-medication practice. When comparing this result with adherence data reported in the literature (50% on average), it can be possible to notice a significant trend towards an overall improvement [9-12]. Altogether, these results indicate that the Turbu+™ e-device can effectively improve the overall adherence to prescribed maintenance therapy in the asthma population.

Nevertheless, drug usage patterns evaluation indicates a preferential use of SMART approaches over non-SMART regimens. SMART approaches, which include an on-demand administration of corticosteroids, result to be significantly preferred over traditional maintenance therapies (or non-SMART regimens). In particular, the addition of an on-demand anti-inflammatory medication can sustain improved patient compliance as it can allow for optimized disease control. Importantly, a SMART approach can rationally offer the chance of treating a large plethora of symptoms, thus supporting a more patient-centric approach.

## Conclusion

In particular, this approach results as extremely useful due to asthma’s highly heterogeneous nature in terms of clinical manifestations, comorbidities and asthma triggers and etiopathological causes. Patient-

centric approaches, alongside with a correct communication between patients and clinicians, might have a positive impact on disease control, ultimately sustaining the optimization of asthma management.

Our evaluation these observations may highlight an overall incrementation of asthma treatment adherence with the utilization of the Turbu+™ e-device as compared with literature. Asthma patients appear to be more compliant with SMART approaches, reflecting a likely improved control over different types of symptoms compared to other therapeutic options.

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## References

1. Winer, Rachel A, Xiaoting Qin, Theresa Harrington, and Jeanne Moorman, et al. "Asthma Incidence among Children and Adults: Findings from the Behavioral Risk Factor Surveillance System Asthma Call-Back Survey-United States, 2006–2008." *J Asthma* 49(2012):16-22.
2. Selroos, Olof, Maciej Kupczyk, Piotr Kuna, and Piotr Łacwik, et al. "National and Regional Asthma Programmes in Europe." *Eur Respir Rev* 24(2015):474-483.
3. GINA. "Global Strategy for Asthma Management and Prevention." *Global Initiative for Asthma* 2018.
4. Borish, Larry. "The Immunology of Asthma: Asthma Phenotypes and their Implications for Personalized Treatment." *Ann Allergy Asthma Immunol* 117(2016):108-114.
5. Sobieraj, Diana M, William L Baker, Elaine Nguyen, and Erin R Weeda, et al. "Association of Inhaled Corticosteroids and Long-Acting Muscarinic Antagonists with Asthma Control in Patients with Uncontrolled, Persistent Asthma: A Systematic Review and Meta-Analysis." *JAMA* 319(2018):1473-1484.
6. Price, David, Monica Fletcher, and Thys van der Molen. "Asthma Control and Management in 8,000 European Patients: The REcognise Asthma and Link to Symptoms and Experience (REALISE) Survey." *NPJ Prim Care Respir Med* 24(2014):1-10.
7. Demoly, P, K Annunziata, E Gubba, and L Adamek. "Repeated Cross-Sectional Survey of Patient-Reported Asthma Control in Europe in the Past 5 Years." *Eur Respir Rev* 21(2012):66-74.
8. Fuhlbrigge, Anne, Michael L Reed, David A Stempel, and Hector O Ortega, et al. "The Status of Asthma Control in the US Adult Population." *Allergy Asthma Proc* 30(2009):529-533.
9. Rand, Cynthia S, and Robert A Wise. "Measuring Adherence to Asthma Medication Regimens." *Am J Respir Crit Care Med* 149(1994):69-76.
10. Nieuwlaat, Robby, Nancy Wilczynski, Tamara Navarro, and Nicholas Hobson, et al. "Interventions for Enhancing Medication Adherence." *Cochrane Database Syst Rev* 11(2014).
11. McDonald, Heather P, Amit X Garg, and R Brian Haynes. "Interventions to Enhance Patient Adherence to Medication Prescriptions: Scientific Review." *JAMA* 288(2002):2868-2879.
12. WHO. "Adherence to Long-Term Therapies: Evidence for Action." *World Health Organization* 2003.
13. van Boven, Job Fm, Jaap CA Trappenburg, Thys van der Molen, and Niels H. Chavannes. "Towards Tailored and Targeted Adherence Assessment to Optimise Asthma Management." *NPJ Prim Care Respir Med* 25(2015):1-6.
14. Bender, Bruce G, and Sarah E Bender. "Patient-Identified Barriers to Asthma Treatment Adherence: responses to Interviews, Focus Groups, and Questionnaires." *Immunol Allergy Clin North Am* 25(2005):107-130.
15. Gamble, Jacqueline, Michael Stevenson, and Liam G Heaney. "A Study of a Multi-Level Intervention to Improve Non-Adherence in Difficult to Control Asthma." *Respir Med* 105(2011):1308-1315.
16. Chan, Amy Hai Yan, Helen Kathryn Reddel, Andrea Apter, and Michelle Eakin, et al. "Adherence Monitoring and E-Health: How Clinicians and Researchers Can Use Technology to Promote Inhaler Adherence for Asthma." *J Allergy Clin Immunol Pract* 1(2013):446-454.
17. Foster, Juliet M, Tim Usherwood, Lorraine Smith, and Susan M Sawyer, et al. "Inhaler reminders Improve Adherence with Controller Treatment in Primary Care Patients with Asthma." *J Allergy Clin Immunol* 134(2014):1260-1268.
18. Howard, Sam, Alexandra Lang, Sarah Sharples, and Dominick Shaw. "What are the Pros and Cons of Electronically Monitoring Inhaler Use in Asthma? A Multistakeholder Perspective." *BMJ Open Respir Res* 3(2016):e000159.

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