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# Using a pharmacist-led asthma service to assess the concordance between patient-reported ICS adherence and objective e-monitoring of ICS therapy

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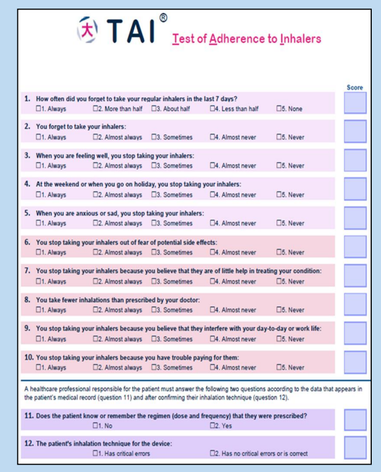
## Introduction and Aim

- The prevalence of asthma, and the scale of sub-optimal inhaled corticosteroid (ICS) use therein, requires efficient detection of non-adherence. While several tools are available to estimate adherence to medicines in asthma, each varies in its limitations.
- The Test of Adherence to Inhalers[1] (TAI) questionnaire asks patients to rate their agreement with 10-items on a 5-point Likert scale. The items investigate intentional and unintentional non-adherence. The subsequent score classifies adherence as good (50/50), intermediate or poor (≤45/50). Two additional questions clarify patient recall of the dose regimen and inhaler technique.
- A more objective, though currently less accessible tool, is the electronic monitor (eMonitor), where a Bluetooth enabled sensor is attached to the inhaler device to record the date/time of each actuation. If actual use is ≥75% of expected use, adherence is good.
- Nitric Oxide in the exhaled breath can indicate inflammation due to asthma and measurement of Fractionated expired Nitric Oxide (FeNO) is a simple and non-invasive way of determining airways inflammation. The higher the value, the more inflammation is present.
- Inhaled corticosteroids (ICS) reduce lung epithelial inflammation and therefore FeNO. Consequently, the impact of guaranteed ICS administration (e.g. seen via an eMonitor) on an individual's HIGH FeNO result (≥45ppb) can differentiate non-adherence to ICS therapy (the FeNO decreases significantly) from asthma inflammation refractory to high dose ICS therapy (there is so significant drop in FeNO). This is the FeNO suppression test[2] (FST).
- The aim of this evaluation was to ascertain whether the adherence classification from the patient completed TAI questionnaire correlated with adherence on an eMonitor


TAI® Test of Adherence to Inhalers

| | Score |
|---|---|
| 1. How often did you forget to take your regular inhalers in the last 7 days? ☐1. Always ☐2. More than half ☐3. About half ☐4. Less than half ☐5. None | |
| 2. You forget to take your inhalers: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |
| 3. When you are feeling well, you stop taking your inhalers: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |
| 4. At the weekend or when you go on holiday, you stop taking your inhalers: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |
| 5. When you are anxious or sad, you stop taking your inhalers: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |
| 6. You stop taking your inhalers out of fear of potential side effects: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |
| 7. You stop taking your inhalers because you believe that they are of little help in treating your condition: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |
| 8. You take fewer inhalations than prescribed by your doctor: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |
| 9. You stop taking your inhalers because you believe that they interfere with your day-to-day or work life: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |
| 10. You stop taking your inhalers because you have trouble paying for them: ☐1. Always ☐2. Almost always ☐3. Sometimes ☐4. Almost never ☐5. Never | |

A healthcare professional responsible for the patient must answer the following two questions according to the data that appears in the patient's medical record (question 11) and after confirming their inhalation technique (question 12).

| | |
|---|---|
| 11. Does the patient know or remember the regimen (dose and frequency) that they were prescribed? ☐1. No ☐2. Yes | |
| 12. The patient's inhalation technique for the device: ☐1. Has critical errors ☐2. Has no critical errors or is correct | |


## Methods

- Patients attending a hospital difficult-to-treat asthma clinic completed the TAI questionnaire, had their FeNO measured, were coached on optimal ellipta inhaler technique and were given a Propeller® eMonitor to use on their ICS-containing ellipta inhaler at home.
- Patients were followed up 6-8 weeks later and at this appointment, the pharmacist re-checked their FeNO and extracted their eMonitoring adherence data from the Propeller portal. eMonitoring adherence was deemed optimal if it was ≥75% expected.
- The FST was positive if the follow-up FeNO value had decreased by ≥42% from the baseline FeNO.

## Results

- Data for 100 consecutive patients were analysed.
- 12/100 patients were excluded because they did not have the high baseline FeNO required to complete a FST; 12/88 patients were excluded because their eMonitoring data demonstrated suboptimal adherence, thus leaving data for 76 patients with good ICS adherence on the eMonitor available for this analysis.
- 35/76 of people exhibited a significant drop in their FeNO, that is, a positive FST.
  - 12/35 (34%) had completed a TAI that implied their adherence was good, 19/35 (54%) that their adherence was intermediate and 4/35 (11%) that it was poor.
- 41/76 had a negative FST, that is, there was no significant drop in their FeNO.
  - 15/41 (37%) answered their TAI to suggest their adherence was good, 21/41 (51%) that it was intermediate and 5/41 (12%), that it was poor.

The degree of agreement between patient reported adherence (TAI) and biomarker-led interpretation of adherence (FST)

| | | eMonitoring/FeNO result | |
|---|---|---|---|
| | | FST positive (n=35) | FST negative (n=41) |
| T | Good (n=27) | 12 | **15** |
| A | Intermediate (n=40) | 19 | 21 |
| I | Poor (n=9) | **4** | 5 |

The numbers in green represent agreement between the TAI and biomarker-led interpretation of adherence

## Discussion & Conclusion

- Literature consistently reports adherence to an ICS in asthma as ~50%[3,4]. With figures suggesting 5.4 million people in the UK have asthma and their outcomes are some of the worst in Europe, there is a clear need for a simple and effective way to identify those in need of medicines optimisation.
- The TAI questionnaire is simple, accessible (in multiple languages), and considered one of the most robust patient reported adherence questionnaires available[5]. However, in this cohort, a third of patients with eMonitoring/biomarker evidence to suggest *suboptimal* ICS adherence (that is, a positive FST) had completed a TAI that *over-estimated* ICS use. Conversely, in the FST negative patients (likely to have been adherent prior to eMonitor initiation), almost two thirds of patients identified themselves on TAI as having suboptimal adherence. This appears to suggest that the TAI may not accurately predict adherence and limit its usefulness in attempts to triage patients for a more in-depth adherence review or eMonitoring.
- A previously published audit of patients in this clinic[6] concurred with the aforementioned literature[3,4]. It suggested that upon scrutinising prescription refill data, half of patients had suboptimal adherence in the year before referral. Similarly, of the 88 people included in this analysis, 47 (54%) could be described as having poor adherence - 12 had poor adherence observed on the eMonitor and 35 had a positive FST suggesting poor adherence *prior* to the eMonitor (but interestingly, good adherence observed *on* the eMonitor). This presents a potential confounder to consider before we reject the TAI – that in some people, using the eMonitor in itself encourages better adherence, at least in the short-term.
- In conclusion, the TAI may be useful to identify patients with sub-optimal adherence requiring further support, but that the use of eMonitoring not only allows objective classification of adherence, it may also support its improvement.

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