Electronic Medication Monitoring vs. Self-Reported Use of Inhaled Corticosteroids and Short-Acting Beta$_2$-Agonists in Adult Patients with Uncontrolled Asthma

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Rationale

- Self-reported inhaled corticosteroid (ICS) and Short-Acting Beta$_2$-Agonist (SABA) use may be inaccurate.
- This may lead to inappropriate clinical decision-making, keep patients from achieving their treatment goals and adversely impact healthcare costs.
- This study compares self-reported ICS and SABA use with objective data from electronic medication monitors (EMM).

Methods

- Adults with uncontrolled asthma (defined by Asthma Control Test Scores of ≤19 and/or per NHLBI NAEPP EPR-3 guideline criteria) and prescribed ICS and SABA by their asthma specialist were enrolled.
- At visit one, participants' ICS and SABA inhalers were fitted with EMMs (Propeller Health, USA) to track real-time medication usage over an average of 15 days. Participants were asked to complete paper diaries to self-report medication usage over the same time period.
- Self-reported vs. EMM-measured ICS adherence and SABA use was compared using paired t-tests and Wilcoxon signed-rank tests.

Results

Table 1. Baseline characteristics

Characteristic	Overall n = 100
Age, mean years (SD)	48.5 (12.3)
Female gender, n (%)	80 (80)
Race, n (%)	
Black or African American	26 (26)
Asian	6 (6)
White or Caucasian	68 (68)
ICS containing medications, n (%)*	
ICS monotherapy	18 (18)
ICS and LABA combination therapy	81 (81)
ICS and LABA and LAMA combination therapy	1 (1)
Uncontrolled asthma defined by ≥ 1 criteria below†	100 (100)
EPR-3 asthma guidelines, n (%)	81 (81)
ACT score ≤ 19	67 (67)
≥ 2 courses of oral corticosteroids for an asthma exacerbation	47 (47)
≥ 1 ED visit or hospitalization for an asthma exacerbation	28 (28)

*Ten participants were on both ICS and ICS/LABA medications, and all reported that their primary controller medication was the ICS/LABA. In these cases, only their ICS/LABA inhaler was fitted with an EMM.
† Criteria for uncontrolled asthma extracted and/or verified by EMR review .

Table 2. EMM vs. self-reported ICS adherence, % (n = 96*) and SABA use, puffs/day (n = 91†) ‡

	Median (IQR)	Mean (SD)	Wilcoxon signed-rank test	Paired t-test	Mean difference (95% CI)
EMM-measured SABA use	0.4 (0.1, 2.1)	1.4 (2.0)	P = 0.64	P = 0.50	-0.1 (-0.5, 0.2)
Self-reported SABA use	0.8 (0.0, 2.0)	1.6 (2.2)			
EMM-measured ICS adherence	75 (54, 93)	70 (28)	P = 0.002	P = 0.01	-10 (-17, -2)
Self-reported ICS adherence	97 (67, 100)	80 (31)			

*Note, n does not equal 100. Instead n=91 due to early withdrawal (n=1), final study visit not completed (n=2), first synced their inhaler sensor after baseline (n=2) and did not have a sensor for their SABA inhaler (n=4).
†Note, n does not equal 100. Instead n=96 due to early withdrawal (n=1), final study visit not completed (n=2), first synced their inhaler sensor after baseline (n=1).
‡On average, the study period=15 days (range: 7, 27).

Figure 1. Mean ICS Adherence (%)

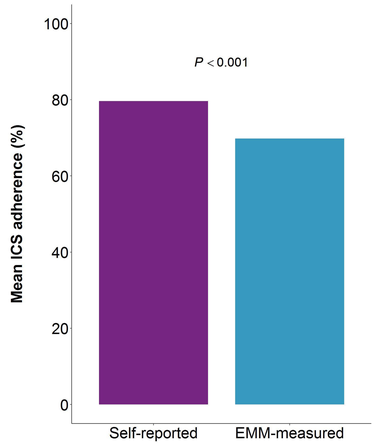
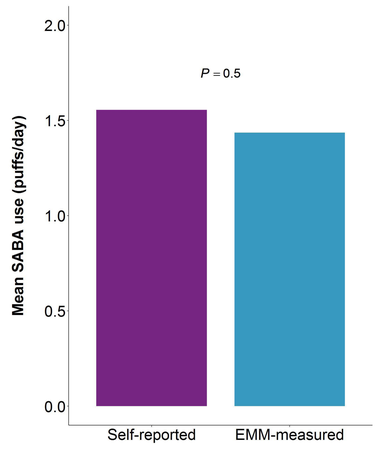


Figure 2. Mean SABA Use (puffs/day)



- 100 participants (80% female, mean age 48.5 years, 60% completed college, 80% privately insured) were enrolled.
- Self-reported mean (SD) ICS adherence (80% [31]) and median (IQR) SABA use (0.8 puffs [0.0-2.0]) was higher than EMM-measured ICS adherence (70% [28], P=0.01) and SABA use (0.4 puffs [0.1-2.1], P=0.64).

Conclusion

- There was significant over-reporting of ICS use by patients. This may lead to clinical decision-making based on flawed information and ultimately result in inappropriate increases in therapy, increased medication regimen complexity and escalate health care costs.
- Use of EMMs may increase the accuracy of medication usage reporting and allow healthcare providers to make more informed treatment recommendations for patients.

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