ABSTRACT BODY:

PURPOSE: It is estimated that up to 70-90% of asthma and COPD patients use their Metered Dose Inhalers (MDIs) incorrectly. However, clinicians often fail to detect patients’ incorrect MDI technique by observation alone. In this study, we quantitatively examined the accuracy of MDI technique of 23 physician-diagnosed asthma and COPD patients in an outpatient clinic setting using CapMedic, an electronic MDI technique-monitoring tool (Cognita Labs, Houston, TX). We used these quantitative data to determine accuracy and limitations of the current practice that empirically assess MDI use by observation alone.

METHODS: 23 physician-diagnosed patients (19 asthma, 4 COPD, 6 male, 17 female, aged 20-65) were recruited in the study from the Pulmonary Function Lab of Ben Taub General Hospital in Houston, Texas. Each patient was given a placebo MDI attached to the CapMedic device. CapMedic is a small electronic cap attached to the MDI canister that passively records the following seven MDI steps:

- number of MDI shakes before actuation
- coordination (time, in seconds, of actuating MDI after start of inhalation)
- mean inspiratory flowrate (L/min)
- number of actuations per inhalation
- duration of inspiration (in seconds)
- orientation of inhaler during actuation (angle from the vertical position, in degrees)
- number of incorrect exhalations post actuation.

The clinical staff conducting the study also recorded the same parameters qualitatively by observation using a checklist, using binary answers based on guidelines (correct/incorrect). Furthermore, due to limitations of the device, the staff could record an additional parameter of breath hold after inhalation.

RESULTS: Data recorded by CapMedic demonstrated that that 100% of the patients made at least one error in using an MDI and 74% made at least 3 errors. The distribution of patients performing correct MDI steps as recorded by CapMedic was as follows:

- Shaking before actuation - 52%
- Positive Coordination (actuating after start of inhalation) - 35%
- Mean inspiratory flowrate within 30-60L/min - 22%
- Only one actuation per inhalation - 96%
- Duration of inspiration > 3 seconds - 9%
- Upright orientation of inhaler during actuation (within 30° from the vertical position) - 56%
- No exhalations post actuation - 83%

By observation only, 60% of the errors recorded by CapMedic were missed due to its qualitative nature and human error. These were mainly for coordination, inspiratory flow rate, duration of inspiration, the orientation of inhaler and shaking. However, observation revealed that only 74% of patients remembered to breath-hold post-actuation in addition to the above parameters.

CONCLUSIONS: We conclude that using an objective tool (CapMedic) to assess competence with MDI use is able to detect significant errors in its use and is more sensitive in identifying and quantifying such errors in use than by observation alone.

CLINICAL IMPLICATIONS: The CapMedic provides accurate, quantified measurements of MDI use and should be preferentially used over observation alone in clinical practice to assess competence in using MDIs.