Effect of shake-fire delay on the amount of delivered dose from a pMDI albuterol HFA

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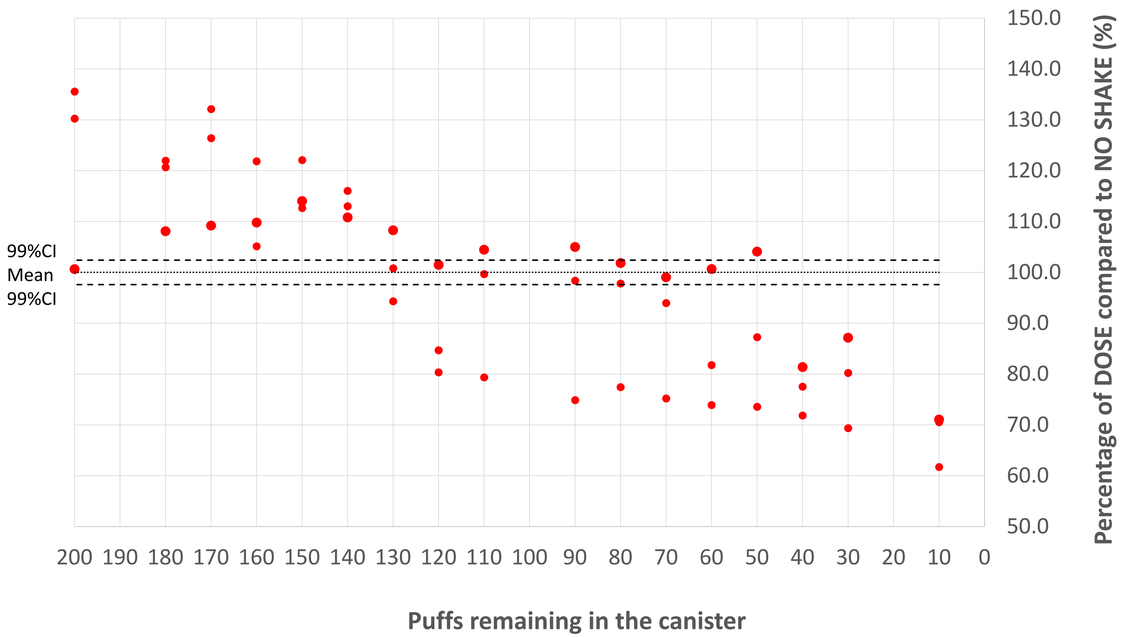
Background

Bronchodilators such as albuterol are used to treat asthma exacerbations. Albuterol is formulated as a pressurized metered dose inhaler (pMDI) suspension. The use of (pMDI) of suspensions requires shaking the canister before actuation to prevent drug sedimentation. Previous studies, done at the beginning of the canister life of pMDI suspensions, revealed an increased in delivered dose (DOSE) when a shake-fire delay occurred. We hypothesize that a shake-fire delay of albuterol HFA pMDI will result in an increase and decrease in DOSE at the beginning and end of the canister life respectively.

Methods

Three new albuterol pMDIs (Ventolin HFA, 90 µg/actuation, 200 doses) operated without shake-fire delay were compared to another 3 inhalers of same brand/lot operated with a 30s shake-fire delay. Ten puffs (30 s interval between puffs and 5 s shacking time) were actuated into drug recovery apparatus operated at 30 L/min suction flow. Inhalers were studied throughout their entire life (200 to 0 remaining doses). Albuterol mass was determined via spectrophotometry (276nm). Mean and 99%CI DOSE without shake-fire delay were calculated, and number of values of DOSE with shake-fire delay that were outside the 99%CI was determined. The number of DOSE values with shake-fire delay that were either 20% smaller or bigger than the mean of no shake-delay were determined. DOSE of sets of 10 puffs obtained with and without shake-fire delay were compared by non-paired T-test. A p value < 0.05 was considered statistically significant..

Results



- Mean 99%CI DOSE without shake-fire delay = 904 µg 883-926 µg.
- DOSE with shake-fire delay was above, or below 99%CI 41%, and 41% of times respectively.
- DOSE with shake-fire delay was > or < 20% than mean DOSE of no shake-fire delay 16% and 24% of times respectively.
- Decline in DOSE begun when 120 doses were remaining.
- DOSE with shake-fire delay was different from no shake-fire delay for the first and last 30 actuations ($p<0.05$).

Conclusion

Using an albuterol HFA pPMDI with 30s shake-fire delay resulted in increased and decreased DOSE at the beginning and end of canister life respectively. We recommend instructing patients to re-shake the pMDI if it is not immediately actuated shaking it

Applying Evidence to Practice

We recommend instructing patients to re-shake the pMDI if it is not immediately actuated shaking it