Online Supplement
High Prevalence of Suboptimal Peak Inspiratory Flow in Hospitalized Patients With COPD: A Real-world Study

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**SUPPLEMENTARY TABLE S1. CATEGORIZATION OF DRY POWDER INHALERS BY INTERNAL RESISTANCE, SUBOPTIMAL PIF THRESHOLDS, AND OPTIMAL PIF THRESHOLDS**

<table>
<thead>
<tr>
<th>Inhaler internal resistance</th>
<th>Inhalers</th>
<th>PIF threshold, L/min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Suboptimal&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Low</td>
<td>Neohaler&lt;sup&gt;®&lt;/sup&gt;</td>
<td>&lt;60</td>
</tr>
<tr>
<td>Medium-low</td>
<td>Diskus&lt;sup&gt;®&lt;/sup&gt;, Ellipta&lt;sup&gt;®&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>RespiClick&lt;sup&gt;®&lt;/sup&gt;, Aerolizer&lt;sup&gt;®&lt;/sup&gt;, Flexhaler&lt;sup&gt;®&lt;/sup&gt;, Pressair&lt;sup&gt;®&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Medium-high</td>
<td>Twisthaler&lt;sup&gt;®&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>HandiHaler&lt;sup&gt;®&lt;/sup&gt;</td>
<td>&lt;30</td>
</tr>
</tbody>
</table>

<sup>a</sup>Defined based on available reference materials.<sup>7-14</sup>

PIF, peak inspiratory flow.
**Supplementary Information:** Peak inspiratory flow (PIF) assessment protocol

*(Supplementary figure. S1)*

- **Before June 2018**
  - Chronic obstructive pulmonary disease (COPD) educators visited patients with a primary or secondary diagnosis of COPD, regardless of admission diagnosis, when an inhaled medication refill was needed.
  - COPD educators opened a new inhaler and assessed PIF using the In-Check™ DIAL G16 set to the corresponding internal resistance of the inhaler the patient was using.
  - PIF was documented in the patient’s electronic health record (EHR).
  - If patients failed to meet the minimum flow required for their prescribed dry powder inhaler (DPI), they were tested for an alternative DPI.

- **June 2018 to present**
  - Respiratory therapists visit patients with a primary or secondary diagnosis of COPD, regardless of admission diagnosis, as soon as possible after admission when patients are stable enough to perform a PIF assessment maneuver.
  - Respiratory therapists assess PIF using the In-Check™ DIAL G16 set to the corresponding internal resistance for that inhaler before opening any metered-dose inhaler/DPI.
  - PIF is documented in patients’ EHRs.
  - If patients failed to meet the minimum flow required for their prescribed DPI, they were tested for an alternative DPI.
  - **PIF protocol**
    - COPD educators assessed PIF using the In-Check™ DIAL G16 set to the corresponding internal resistance for that inhaler.
    - Patients using a metered-dose inhaler or soft mist inhaler were coached not to exceed 30 L/min during assessment; therefore, PIFs could not be calculated because maximum inspiratory effort was not applied.

aRefer to the In-Check™ DIAL user manual for further details.27

DPI, dry powder inhaler; LSCMC, Legacy Salmon Creek Medical Center; PIF, peak inspiratory flow; pMDI, pressurized metered-dose inhaler.
E-Figure-1

**LSCMC PIF protocol**

- Patients were asked to use the In-Check™ DIAL the same way they would use their prescribed inhaler.
  - PIF was then measured for effective flow based on the manufacturer’s recommendations.
- Patients were asked to use the In-Check™ DIAL again after feedback and coaching.
  - Patients were asked to sit up straight if possible, fully exhale until they had no air to push out, and put the mouthpiece in their mouth and keep it level.
  - Patients received instructions on how to use their inhaler.
    - DPIs: breathe in as hard as possible for as long as possible, followed by a breath hold for as long as possible (minimum of 5 seconds; maximum of 10 seconds).
    - pMDIs or Respimat®: breathe in slowly and steadily, followed by a breath hold for 5 to 10 seconds if possible; patients were coached not to exceed 30 L/min.
- PIF was then measured for effective flow based on the manufacturer’s recommendations.
- A color-coded list, with colors corresponding to the resistance settings reflective of manufacturer-recommended flow for each inhaler, was provided with each In-Check™ DIAL, which are available at each Pyxis®.