Gerard Criner, MD, is Professor of Medicine and Director of the Medical Intensive Care and Ventilator Rehabilitation Units at Temple University School of Medicine in Philadelphia, PA, where he also obtained his medical degree in 1989. Dr. Criner completed his internship and residency in internal medicine at Temple University Hospital, and his fellowship in pulmonary and critical care medicine at Boston University School of Medicine in Boston, MA.

Dr. Criner is committee member of the Intensive Care Unit Committee at Temple University Hospital and executive director of Philadelphia Critical Care Society. He also serves on the board of directors for the Global Initiative for Chronic Obstructive Lung Disease (GOLD) and acts as Chairman for the ACCP guidelines on the prevention of acute exacerbations in chronic obstructive pulmonary disease (COPD). He is a member of the board of directors for the Global Initiative for Chronic Obstructive Lung Disease. In 2013, Dr. Criner was the recipient of the Paul W. Eberman Faculty Research Award from Temple University. As a principal investigator, Dr. Criner has received extensive research funding and has conducted several clinical trials in pulmonary disease.

His primary research focuses on advanced lung conditions, including COPD, emphysema, pulmonary fibrosis, pulmonary hypertension, and respiratory failure. Dr. Criner has published over 300 scientific papers, reviews, and book chapters, with numerous research articles in peer-reviewed journals including New England Journal of Medicine, American Journal of Respiratory and Critical Care Medicine (AJRCCM), Chest and Lancet Respiratory Medicine. He serves on the editorial review board of Advances for Respiratory Care Managers and AJRCCM. Dr. Criner has lectured nationally and internationally at numerous scientific meetings and congresses.

**OBJECTIVES:**
Participants should be better able to:

1. Understand what is the importance of diagnosing early COPD;
2. Understand what procedures are being studied for bronchoscopic lung reduction;
3. Understand what impact noninvasive ventilation on improving outcomes in patient with COPD can have.

**THURSDAY, MARCH 3, 2016 8:00 AM**
COPD: Review of What’s New
From Coils to Readmissions

Gerard J. Criner, M.D.
Professor and Chair, Department of Thoracic Medicine and Surgery
Lewis Katz School of Medicine at Temple University
Philadelphia PA USA

Dr. Criner has declared no conflicts of interest related to the content of his presentation.
Presenter Disclosures

Gerard J. Criner, M.D.

(1) The following relationships with commercial interests related to this presentation existed during the past 60 months:

**Honoraria:** None

**Grants received:** NIH-NHLBI, PA-DOH, GSK, Boehringer-Ingelheim, Novartis, AstraZeneca, Respironics, MedImmune, Actelion, Forest, Pharmaxis, Pearl, Ikaria, Aeris, PneumRx, Pulmonx

**Grants pending:** NIH-NHLBI, Ikaria, Hayek, Forest

**Consultation:** GSK, AZ, Pearl, CSA, Amirall, Holaira, Boehringer-Ingelheim

**Equity Interest:** HGE Health Care Solutions, Inc.

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2016 COPD Update

- The morbidity and mortality of chronic obstructive pulmonary disease (COPD) continues in an uninterrupted fashion:
  - Current treatment options are limited
  - There is no cure

- Reasons?
  - Failure to diagnose COPD early
  - Poor correlation of airflow obstruction with the extent and type of structural impairment
  - Comorbid conditions are common
  - Lack of an adequate animal model to study COPD
Can we detect subjects in this group sooner and alter the trajectory of their disease?

Trajectories of Lung Function Decline (Lange, NEJM, 2015)

- TR2: 16.9%
- TR3: 5.5%
- TR4: 6.1%

27ml/yr

53ml/yr
COPDGene: Patient Distribution by GOLD Stages

- AA
- Greater % current Smoker
- Less obstructed
- Less emphysema
- More DM

Preserved Ratio/Impaired Spirometry (PRISm)
(Wan, Resp Res, 2014)

- FEV$_1$ ≤ 80% predicted
- FEV$_1$/FVC ≥ 70%

- AA
- Greater % current Smoker
- Less obstructed
- Less emphysema
- More DM
Are these subjects really normal? Or do they have symptoms or Radiological Findings consistent with COPD?

Clinical and Radiologic Disease in Smokers with Normal Spirometry (Regan, JAMA Int Med, 2015)

- Individuals from COPDGene completed spirometry, HRCT, 6 MWT and questionnaires
- Purpose: to identify clinical and radiological evidence of smoking related disease in a cohort of current and former smokers who did not meet spirometric criteria for COPD
  - (labeled GOLD 0)
- 3 Groups
  - GOLD 0 (n=4388)
  - GOLD 1 (n=794)
  - COPD 2-4 (n=3690)
  - Normals (n=108)
Impairments in COPDGene Subjects
(Regan, JAMA Int Med, 2015)

<table>
<thead>
<tr>
<th>Individual Scores</th>
<th>Non-Smoker</th>
<th>GOLD 0</th>
<th>GOLD 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Bronchitis (by criteria)</td>
<td>0</td>
<td>449 (12%)</td>
<td>104 (15%)</td>
</tr>
<tr>
<td>History of Severe Exacerbation ≥ 1</td>
<td>0</td>
<td>120 (3%)</td>
<td>27 (4%)</td>
</tr>
<tr>
<td>SGRQ: Total &gt;25</td>
<td>4 (4%)</td>
<td>887 (23%)</td>
<td>181 (26%)</td>
</tr>
<tr>
<td>Six Min Walk &lt; 1150 feet (350 m)</td>
<td>4 (4%)</td>
<td>577 (15%)</td>
<td>87 (13%)</td>
</tr>
<tr>
<td>MMRC Dyspnea Score ≥ 2</td>
<td>4 (4%)</td>
<td>802 (21%)</td>
<td>139 (20%)</td>
</tr>
<tr>
<td>Emphysema &gt; 5%</td>
<td>8 (8%)</td>
<td>394 (11%)</td>
<td>234 (35%)</td>
</tr>
<tr>
<td>Gas Trapping &gt;20%</td>
<td>10 (10%)</td>
<td>483 (15%)</td>
<td>276 (47%)</td>
</tr>
</tbody>
</table>

Sums

<table>
<thead>
<tr>
<th>Any Impairment</th>
<th>N= 197</th>
<th>N= 3888</th>
<th>N= 687</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 impairments</td>
<td>0</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>5 impairments</td>
<td>0</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>4 impairments</td>
<td>0</td>
<td>107</td>
<td>46</td>
</tr>
<tr>
<td>3 impairments</td>
<td>1</td>
<td>317</td>
<td>76</td>
</tr>
<tr>
<td>2 impairments</td>
<td>3</td>
<td>591</td>
<td>174</td>
</tr>
<tr>
<td>1 impairment</td>
<td>21</td>
<td>1010</td>
<td>383</td>
</tr>
<tr>
<td>No Impairment</td>
<td>82 (77%)</td>
<td>1836 (47%)</td>
<td>188 (27%)</td>
</tr>
</tbody>
</table>

Natural History Normal Spirometry/Low DLCO
(Harvey, ERJ, 2015)

- Normal Spirometry Normal DLCO
- Normal Spirometry Low DLCO

3 % Develop COPD
22 % Develop COPD
FLIGHT 1 and 2: Efficacy and Safety of Indacaterol/Glycopyrrolate vs Monocomponents and Placebo in COPD (Mahler, AJRCCM, 2015)

WISDOM: Withdrawal of ICS and AECOPD
(Magnussen, NEJM, 2014)

![Graph showing Trough FEV1 (L) over Day 1, Week 12, and Week 26 for QVA149 110/50 µg od and SFC 50/500 µg bid.]

- Day 1: QVA149 110/50 µg od 1.264 ± 0.03, n=350; SFC 50/500 µg bid 1.221 ± 0.03, n=351.
- Week 12: QVA149 110/50 µg od 1.284 ± 0.03, n=342; SFC 50/500 µg bid 1.206 ± 0.03, n=332.
- Week 26: QVA149 110/50 µg od 1.259 ± 0.03, n=352; SFC 50/500 µg bid 1.183 ± 0.03, n=340.

- Week 12 Trough FEV1 is significantly different (p=0.015).


![Graph showing probability of exacerbation (%) over days for QVA149 110/50 µg od and SFC 50/500 µg bid.]

- Probability of exacerbation: QVA149: 0 (0.0%) at 0 days, increasing to 43 (12.1%) at 184 days; SFC: 0 (0.0%) at 0 days, increasing to 67 (18.9%) at 184 days.
- Hazard Ratio (HR): 0.65, 95% CI: 0.44, 0.95 (p=0.028).

Patients with exacerbation (%):
- QVA149: 0 (0.0%), 12 (3.3%), 20 (5.5%), 31 (8.6%), 43 (12.1%)
- SFC: 0 (0.0%), 24 (6.6%), 38 (10.5%), 48 (13.4%), 67 (18.9%)
Acute Exacerbations of COPD: Biologic Clusters and Their Biomarkers

Elevated Eosinophils are Associated with Higher Exacerbation Rates

(Adapted from Pascoe, ERJ 2015)
Differential Improvement in Exacerbations: Predefined Analysis by Blood Eosinophil Levels

Blood Eosinophils (cells/µL)

<table>
<thead>
<tr>
<th>Group</th>
<th>&lt;200</th>
<th>≥200</th>
<th>&lt;300</th>
<th>≥300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>n=21</td>
<td>n=20</td>
<td>n=34</td>
<td>n=7</td>
</tr>
<tr>
<td>Benralizumab 100 mg</td>
<td>n=21</td>
<td>n=19</td>
<td>n=26</td>
<td>n=14</td>
</tr>
</tbody>
</table>

-64% (-205%, 12%)  31% (-32%, 64%)  -45% (-134%, 11%)  58% (-25%, 86%)

Rate of acute exacerbations per person per year

CXCR2 Antagonist MK-7123  (Rennard, AJRCCM, 2015)

Neutrophils, % (± SE)

<table>
<thead>
<tr>
<th>Group</th>
<th>0 Day</th>
<th>Wk 1</th>
<th>Wk 2</th>
<th>Wk 3</th>
<th>Wk 4</th>
<th>Wk 5</th>
<th>Wk 6</th>
<th>Wk 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>5.0</td>
<td>4.5</td>
<td>4.3</td>
<td>4.2</td>
<td>4.1</td>
<td>4.0</td>
<td>3.9</td>
<td>3.8</td>
</tr>
<tr>
<td>10 mg</td>
<td>4.8</td>
<td>4.7</td>
<td>4.6</td>
<td>4.5</td>
<td>4.4</td>
<td>4.3</td>
<td>4.2</td>
<td>4.1</td>
</tr>
<tr>
<td>30 mg</td>
<td>4.5</td>
<td>4.4</td>
<td>4.3</td>
<td>4.2</td>
<td>4.1</td>
<td>4.0</td>
<td>3.9</td>
<td>3.8</td>
</tr>
<tr>
<td>50 mg</td>
<td>4.2</td>
<td>4.1</td>
<td>4.0</td>
<td>3.9</td>
<td>3.8</td>
<td>3.7</td>
<td>3.6</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Flow Vel. % (± SE)

<table>
<thead>
<tr>
<th>Group</th>
<th>0 Day</th>
<th>Wk 1</th>
<th>Wk 2</th>
<th>Wk 3</th>
<th>Wk 4</th>
<th>Wk 5</th>
<th>Wk 6</th>
<th>Wk 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>10 mg</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>30 mg</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>50 mg</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
CXCR2 Antagonist MK-7123

Hyperinflation In Emphysema

- Hyperinflation: devastating & common complication of COPD; especially emphysematous phenotype
  - Decreased Exercise Performance
  - Impaired Respiratory Muscle and Chest Wall Mechanics
  - Increased Breathlessness, Decreased Quality of Life
  - Prolonged Respiratory Failure Requiring Mechanical Ventilation
  - Increased Mortality (IC/TLC)
Endobronchial Valves and Coils for Lung Reduction

Endobronchial Valves

Lung Coil

Endobronchial Valves and Coils for Emphysema PalliatioN Trial (VENT) Pivotal Trial:
6 months: Primary Endpoints

FEV₁ % Change

<table>
<thead>
<tr>
<th></th>
<th>Control (n=101)</th>
<th>Treatment (n=220)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ</td>
<td>-0.8%</td>
<td>5.9%</td>
</tr>
<tr>
<td>p</td>
<td></td>
<td>0.0084</td>
</tr>
</tbody>
</table>

6MWT % Change

<table>
<thead>
<tr>
<th></th>
<th>Control (n=101)</th>
<th>Treatment (n=220)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ</td>
<td>0.1%</td>
<td>4.9%</td>
</tr>
<tr>
<td>p</td>
<td></td>
<td>0.0171</td>
</tr>
</tbody>
</table>

Sciurba, NEJM, 2010
Impact of Heterogeneity on EBV Outcome
(Sciurba, NEJM, 2010)

<table>
<thead>
<tr>
<th>Degree of Heterogeneity</th>
<th>Percent Change in FEV1 (Treatment-Control)</th>
<th>Point Estimate (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;25%</td>
<td>15.3 (5.3 to 25.3)</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>15% to &lt;25%</td>
<td>5.8 (-4.5 to 16.1)</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>&lt;5%</td>
<td>3.9 (-1.4 to 13.1)</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>&lt;1%</td>
<td>-0.4 (-8.8 to 8.1)</td>
<td>0.93</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree of Heterogeneity</th>
<th>Percent Change in 6MWT (Treatment-Control)</th>
<th>Point Estimate (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;25%</td>
<td>16.2 (2.8 to 29.6)</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>15% to &lt;25%</td>
<td>8.1 (-4.6 to 17.8)</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>&lt;5%</td>
<td>-2.7 (-16.6 to 11.1)</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td>&lt;1%</td>
<td>0.7 (-7.9 to 9.3)</td>
<td>0.89</td>
<td></td>
</tr>
</tbody>
</table>

Predicting Atelectasis by Assessment of Collateral Ventilation
Prior to EBV Placement: Safety and Efficacy
(Gomplemann, Inter Pulm, 2010)

High collateral resistance

Low collateral resistance
Endobronchial Valves for Emphysema Without Interlobar Collateral Ventilation (Klooster, NEJM, 2015)

Between Group (EBV vs. Control) Difference in Homogenous and Heterogeneous Emphysema (Klooster, NEJM, 2015)
Lung Volume Reduction Coil Treatment vs. Usual Care in Severe Emphysema: REVOLENS Randomized Clinical Trial (Deslee, JAMA, 2016)

- **Interventions:**
  - 100 patients randomized to LVRC vs usual care
  - 10 coils placed in both lungs sequentially
- **Primary outcome:**
  - Improvement in 6 MWT by 54 meters at 6 months
- **Secondary outcomes:**
  - SGRQ
  - Mortality
  - Cost-effectiveness
Lung Volume Reduction Coil Treatment vs. Usual Care in Severe Emphysema: REVOLENS Randomized Clinical Trial (Deslee, JAMA, 2016)

Hospitalized Severe AECOPD and Mortality: Severity of AECOPD  Soler-Cataluna Thorax 2005

1- no AECOPD
2- AECOPD ED
3- AECOPD Hosp
4- AECOPD Readmit

Probability of surviving
0.0 0.2 0.4 0.6 0.8 1.0
0 10 20 30 40 50 60
Time (months)

p<0.0001
p=0.005
NS

1

(1)

(2)

(3)

(4)
Risks for Hospitalized Exacerbations of COPD
(Mullerova, Chest, 2015)

Impact of Chronic Bronchitis in the PLATINO Study
(Montes de Oca, ERJ, 2012)
**Roflumilast and Effect on Severe Exacerbations: EXACT**

(Martinez, Lancet 2015)

- **Number at risk:**
  - Placebo group: 192; roflumilast 153
  - Placebo group: 157; roflumilast 120
  - Placebo group: 190; roflumilast 159

- **Severe exacerbations:**
  - Placebo group: 0.315
  - Roflumilast group: 0.295
  - Placebo group: 0.326
  - Roflumilast group: 0.218

- **Exacerbations leading to hospital admission:**
  - Placebo group: 0.213
  - Roflumilast group: 0.238

**NPPV Use and Hospitalization Free Survival**

(Galli, Respir Med, 2014)

- **Percent Survival:**
  - NPPV Post Discharge Group
  - No NPPV Post Discharge Group

- **p=0.0001**

- **Days to Readmission or Death:**
  - 0%
  - 25%
  - 50%
  - 75%
  - 100%

- **Survival Rates:**
  - NPPV Post Discharge Group: 100%, 75%, 50%, 25%, 0%
  - No NPPV Post Discharge Group: 100%, 75%, 50%, 25%, 0%
Retrospective Assessment of Home Ventilation to Reduce Rehospitalization in COPD (Coughlin, J Clin Sleep Med, 2015)

Table 2—Hospital readmissions following initiation of quality improvement program.

<table>
<thead>
<tr>
<th>Number of COPD-related Admissions</th>
<th>Patients with admission in the year prior to program initiation (n [%])</th>
<th>Patients with admission in the year post program initiation (n [%])</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 (0%)</td>
<td>348 (87.7%)</td>
</tr>
<tr>
<td>1</td>
<td>0 (0%)</td>
<td>40 (10.1%)</td>
</tr>
<tr>
<td>≥ 2</td>
<td>397 (100%)</td>
<td>9 (2.2%)</td>
</tr>
</tbody>
</table>

Admissions among the 397 COPD patients enrolled in the QI program. n (%), unless otherwise stated. COPD = chronic obstructive pulmonary disease.

Conflicting Outcomes From Recent PRCTs in Hypercapneic COPD

Significant Features About These Two Studies

• Patient selection
  – Struik applied NPPV after patients received NPPV acutely in hospital
  – Subjects had received some form of ventilation during that hospitalization

• Technique of NPPV application
  – not blinded
  – Normocapnia was goal in NPPV group

• Patient selection
  – Kohnlein recruited patients who were stable for at least 4 weeks prior to enrollment
  – Kohnlein took 6 years to recruit 201 patients from 36 centers

• Technique of NPPV application
  – not blinded
  – Kohnlein used Hi-intensity NPPV—substantial reduction in PaCO2 (20%)
  – Kohnlein admitted patients to hospital for 5.6 days on average

Hospital Readmissions: Contributing Factors
(Jencks, NEJM, 2009)

• Poorly coordinated Transition of care
  • Poor knowledge of disease
  • Gaps in medical regime
  • Unaware of early signs of disease worsening

• Poor use of EBM

• Failure to keep MD appt
  • Within 5–7 days of DC
  • 75% 30-Day readmits no MD visit
Age Adjusted Morality of COPD has Plateaued in the Past Decade (Ford, Chest, 2015)

Summary

• New information performed over the past year demonstrate that substantial progress is being made in our understanding of the pathogenesis, phenotypic classification and development of novel therapeutic approaches in the care of the COPD patient
Between Group (EBV vs. Control) Difference in Homogenous and Heterogeneous Emphysema
(Klooster, NEJM, 2015)

<table>
<thead>
<tr>
<th>Effectiveness outcomes (-950HU)</th>
<th>Between-group difference EBV N=16 vs Control N=18 Homogenous distribution</th>
<th>P value</th>
<th>Between-group difference EBV N=9 vs Control N=15 Heterogeneous distribution</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forced expiratory volume in 1 sec</td>
<td>- ml 127 (8 to 247)</td>
<td>0.037</td>
<td>291 (189 to 392)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>- % 15 (2 to 28)</td>
<td>0.028</td>
<td>36 (24 to 48)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Forced vital capacity</td>
<td>- ml 255 (87 to 598)</td>
<td>0.139</td>
<td>712 (460 to 965)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>- % 9 (4 to 22)</td>
<td>0.157</td>
<td>30 (16 to 44)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Residual volume</td>
<td>- ml -715 (-1108 to -322)</td>
<td>0.001</td>
<td>-997 (-1382 to -612)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>- % -16 (-22 to -9)</td>
<td>&lt;0.001</td>
<td>-20 (-27 to -13)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Distance on 6-minute walk test</td>
<td>- meter 107 (69 to 145)</td>
<td>&lt;0.001</td>
<td>108 (71 to 145)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SGRQ Total score</td>
<td>- points -12 (-21 to -4)</td>
<td>0.008</td>
<td>-19 (-31 to -6)</td>
<td>0.005</td>
</tr>
</tbody>
</table>
Impact of Outpatient Appointment Availability on 30-Day Readmission Rate (Sharma, Arch Inter Med, 2010)

Multivariate Risk Factors
- Gender
- CHF
- Lung Cancer
- Anxiety/Depression
- Osteoporosis
- Ace/Statins/SABA/SAMA/Oral steroids
- Antibiotics < 30-days
- LOS > 7 days
- Prior Hospitalization
- No follow-up visits < 30 days

30-Day readmission in patients 40-64 yrs. age Admitted for COPD (Sharif, Annals of ATS, 2014)
Bedside Assessment of Quadriceps Muscle by Ultrasound After AECOPD Hospitalization (Greening, AJRCCM, 2015)

BLVR with EBV: BeLieVeR-HiFi Study (Davey Lancet, 2015)

- PRCT sham controlled trial of EBV in 50 subjects with heterogeneous emphysema and intact fissures
- $\Delta$ FEV$_1$ at 3 months with EBV compared with sham controls
- Red symbols represent 4 patients who had collateral ventilation by Chartis but still treated with EBV
High T2S Score Associated with Decreased FEV₁ and Increased Airway Wall Eosinophils in a Subset of COPD

(Christenson, AJRCCM, 2015)
Radiologic Markers of Increased Exacerbation Risk

(Pulmonary Arterial Enlargement and Acute Exacerbations of COPD)

(Wells, NEJM, 2012)

CXCR2 Antagonist MK-7123

* P=0.037 vs placebo

CXCR=C-X-C chemokine receptor; FEV=forced expiratory volume; SE = standard error.

A Telemedicine-Based Intervention Reduces the Frequency and Severity of COPD Exacerbations (Cordova, Telemedicine and E-Health 2015)

Significant Decreases Observed in Number of Inpatient Admissions, Inpatient Days, Emergency Department Visits and 30-Day Readmissions Within 180 Days Pre- and 180 Days Post- COPD Co-Pilot Enrollment (All Payors)
2015 Symptom Spikes by Severity (all payors)

Mild: 85.6%
Moderate: 12.6%
Severe: 1.8%

Hospitalized Exacerbations of COPD (Hurst NEJM 2010)

<table>
<thead>
<tr>
<th>Severity</th>
<th>Hospitalized for exacerbation in yr 1 (%)</th>
<th>Frequent exacerbations in yr 1 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD 2  (N=945)</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>GOLD 3  (N=900)</td>
<td>18</td>
<td>33</td>
</tr>
<tr>
<td>GOLD 4  (N=293)</td>
<td>33</td>
<td>47</td>
</tr>
</tbody>
</table>
QUESTION 1
The most important factor that determines outcome in endobronchial lung reduction is:

A. Number of valves
B. Which lobe is treated
C. Patient age
D. Degree of emphysema
E. Lack of collateral ventilation
QUESTION 2
Which statement is true about Noninvasive ventilation in COPD?

A. Consistently reduces hospital readmission rates.
B. Works best in COPD patients who are obese.
C. Consistently improves respiratory muscle strength.
D. Consistently improves lung function.
E. Is easy to get approved for use at home.
QUESTION 3
COPD Patients with no airflow obstruction:

A. Never use any respiratory medications.
B. Have no symptoms.
C. Are more likely to be current smokers.
D. Smoke more pack years than those with obstruction.
E. Have no decline lung function over time.