

## Online Data Supplement

### A Retrospective Claims Analysis of Dual Bronchodilator Fixed-Dose Combination Versus Bronchodilator Monotherapy in Patients with Chronic Obstructive Pulmonary Disease

<sup>1</sup>Charlie Strange, MD<sup>1</sup> Valery Walker, MS<sup>2</sup> Junliang Tong, PhD<sup>2</sup> Jonathan Kurlander, MS<sup>2</sup>  
Maureen Carlyle, MPH<sup>2</sup> Lauren A. Millette, PhD<sup>3</sup> Eric Wittbrodt, PharmD, MPH<sup>3</sup>

<sup>1</sup>Division of Pulmonary and Critical Care Medicine, Medical University of South Carolina, Charleston, South Carolina

<sup>2</sup>Optum, Inc., Eden Prairie, Minnesota

<sup>3</sup>AstraZeneca, Wilmington, Delaware

**eTable 1. Index Medications for Patient Identification**

Cohort	Subclass	Medication
LAMA or LABA Monotherapy	Long-acting muscarinic antagonist (LAMA)	aclidinium
		glycopyrrolate
		tiotropium
		umeclidinium
	Long-acting β-agonists (LABA)	arformoterol
		formoterol
		olodaterol
		salmeterol
		indacaterol
	LABA/LAMA	LABA/LAMA combination (FDC only)
olodaterol/tiotropium		
indacaterol/glycopyrrolate		

FDC: fixed-dose combination

**eTable 2. COPD Codes and Descriptions**

ICD-9-CM	Description	ICD-10-CM	Description
<b>Codes for COPD</b>			
491.0	Simple chronic bronchitis	J410	Simple chronic bronchitis
491.1	Mucopurulent chronic bronchitis	J411	Mucopurulent chronic bronchitis
491.20	Obstructive chronic bronchitis, without exacerbation	J449*	Chronic obstructive pulmonary disease, unspecified
491.21	Obstructive chronic bronchitis, with (acute) exacerbation	J441*	Chronic obstructive pulmonary disease with (acute) exacerbation
491.22	Obstructive chronic bronchitis with acute bronchitis	J440*	Chronic obstructive pulmonary disease with acute lower respiratory infection
491.8	Other chronic bronchitis	J418	Mixed simple and mucopurulent chronic bronchitis
491.9	Unspecified chronic bronchitis	J42	Unspecified chronic bronchitis
492.0	Emphysematous bleb	J439	Emphysema, unspecified
492.8	Other emphysema	J438	Other emphysema
492.8	Other emphysema	J430	Unilateral pulmonary emphysema [MacLeod's syndrome]
492.8	Other emphysema	J431	Panlobular emphysema
492.8	Other emphysema	J432	Centrilobular emphysema
492.8	Other emphysema	J439	Emphysema, unspecified
496	Chronic airway obstruction, not elsewhere classified	J449*	Chronic obstructive pulmonary disease, unspecified
<b>Codes for Chronic Obstructive Asthma</b>			
493.20	Chronic obstructive asthma, unspecified	J449*	Chronic obstructive pulmonary disease, unspecified
493.21	Chronic obstructive asthma with status asthmaticus	J440*	Chronic obstructive pulmonary disease with acute lower respiratory infection
493.22	Chronic obstructive asthma, with (acute) exacerbation	J441*	Chronic obstructive pulmonary disease with (acute) exacerbation

There was not a direct match for ICD-9 codes 491.20, 491.21 and 491.22 to ICD-10 code J449, J441 and J440. The J44\* codes included other chronic obstructive pulmonary diseases. We did not want to include patients with chronic obstructive asthma who were being identified with J440, J441 or J449 codes. Therefore, if a patient had an ICD-10-CM code J440, J441 or J449 and an ICD-9 code of 493.20, 493.21 or 493.22, and no other code confirming for COPD, they were not be included during the patient identification

**eTable 3. Codes for Cystic Fibrosis, Idiopathic Pulmonary Fibrosis, and Asthma**

<b>Code</b>	<b>Code Type</b>	<b>Description</b>
277.00	ICD-9 Dx	Cystic fibrosis without mention of meconium ileus
277.02	ICD-9 Dx	Cystic fibrosis with pulmonary manifestations
277.03	ICD-9 Dx	Cystic fibrosis with gastrointestinal manifestations
277.09	ICD-9 Dx	Cystic fibrosis with other manifestations
E849	ICD-10 Dx	Cystic fibrosis, unspecified
E840	ICD-10 Dx	Cystic fibrosis with pulmonary manifestations
E8419	ICD-10 Dx	Cystic fibrosis with other intestinal manifestations
E848	ICD-10 Dx	Cystic fibrosis with other manifestations
516.31	ICD-9 Dx	Idiopathic pulmonary fibrosis
J84112	ICD-10 Dx	Idiopathic pulmonary fibrosis
493.00	ICD-9 Dx	Extrinsic asthma, unspecified
493.01	ICD-9 Dx	Extrinsic asthma with status asthmaticus
493.02	ICD-9 Dx	Extrinsic asthma, with (acute) exacerbation
493.10	ICD-9 Dx	Intrinsic asthma, unspecified
493.11	ICD-9 Dx	Intrinsic asthma with status asthmaticus
493.12	ICD-9 Dx	Intrinsic asthma, with (acute) exacerbation
493.20	ICD-9 Dx	Chronic obstructive asthma, unspecified
493.21	ICD-9 Dx	Chronic obstructive asthma with status asthmaticus
493.22	ICD-9 Dx	Chronic obstructive asthma, with (acute) exacerbation
493.82	ICD-9 Dx	Cough variant asthma
493.90	ICD-9 Dx	Asthma, unspecified, unspecified status
493.91	ICD-9 Dx	Asthma, unspecified with status asthmaticus
493.92	ICD-9 Dx	Asthma, unspecified, with (acute) exacerbation
J45991	ICD-10 Dx	Cough variant asthma
J4550	ICD-10 Dx	Severe persistent asthma, uncomplicated
J4551	ICD-10 Dx	Severe persistent asthma with (acute) exacerbation
J4552	ICD-10 Dx	Severe persistent asthma with status asthmaticus
J45901	ICD-10 Dx	Unspecified asthma with (acute) exacerbation
J45902	ICD-10 Dx	Unspecified asthma with status asthmaticus
J45909	ICD-10 Dx	Unspecified asthma, uncomplicated
J45998	ICD-10 Dx	Other asthma

**eTable 4. COPD Medications Included in COPD-Related Costs**

Subclass	Medication
Long-acting muscarinic antagonist (LAMA)  Long acting anticholinergic	aclidinium
	glycopyrrolate
	tiotropium
	umeclidinium
Long-acting $\beta$ -agonists (LABA)	arformoterol
	formoterol
	olodaterol
	salmeterol
	indacaterol
LABA/LAMA combination (FDC only)	vilanterol/umeclidinium
	olodaterol/tiotropium
	indacaterol/glycopyrrolate
ICS/LABA combination (FDC only)	fluticasone/salmeterol
	budesonide/formoterol
	fluticasone/vilanterol
	mometasone/formoterol
Inhaled corticosteroids (ICS)	beclomethasone
	budesonide
	ciclesonide
	flunisolide
	fluticasone
	mometasone
	triamcinolone
Oral corticosteroids (OCS)	Betamethasone
	Cortisone Acetate
	Dexamethasone
	Hydrocortisone

	Methylprednisolone
	Prednisolone
	Prednisone
	Triamcinolone
Short-acting muscarinic antagonists (SAMA)	ipratropium
Short-acting beta2-agonist (SABA)	albuterol
	levalbuterol
SAMA/SABA	ipratropium/albuterol

FDC: fixed-dose combination

**Table 5. Baseline Variables Used in Propensity Score Matching**

<b>Baseline Variables used in Propensity Score Matching</b>	<b>Variable Type used in Propensity Score Matching</b>
Patient out of pocket health care costs	categorical – 4 categories
Patient out of pocket COPD-related health care costs	categorical – 4 categories
Total COPD-related health care costs	categorical – 4 categories
Total all-cause health care costs	categorical – 4 categories
Number of COPD-related ED visits	dichotomous – Y/N
Number of all-cause ED visits	dichotomous – Y/N
Number of COPD-related hospitalizations	dichotomous – Y/N
Number of all-cause hospitalizations	dichotomous – Y/N
Gender	dichotomous – Y/N
Quan-Charlson comorbidity score	dichotomous – Y/N
Baseline use of a nebulizer	dichotomous – Y/N
Component from the COPD severity score	
Hospitalization due to Acute Exacerbation of Chronic Bronchitis (AECB)	dichotomous – Y/N
Oxygen Therapy	dichotomous – Y/N
Emphysema	dichotomous – Y/N
Spirometry Tests	dichotomous – Y/N
Pulmonologist Visits	dichotomous – Y/N
Oral Corticosteroids	dichotomous – Y/N
Inhaled Corticosteroids	dichotomous – Y/N
short-acting beta2-agonists (SABAs)	dichotomous – Y/N
short-acting muscarinic antagonists (SAMAs)	dichotomous – Y/N
Age	Continuous

COPD: chronic obstructive pulmonary disease; ED: emergency department