The Burden of

Chronic Obstructive Pulmonary Disease (COPD)

Boehringer Ingelheim

COPD Modules

Description, Impact, and Healthcare Burden

National Quality Landscape

Diagnosis and Treatment

Boehringer Ingelheim

COPD Is a Preventable and Treatable Disease With Progressive Airflow Limitation[1,2]

American Thoracic Society[1]

- A preventable and treatable disease state characterized by airflow limitation that is not fully reversible
- Airflow limitation is usually progressive and is associated with an abnormal inflammatory response of the lungs to noxious particles or gases, primarily caused by cigarette smoking
- Although COPD affects the lungs, it also produces significant systemic consequences

Global Initiative for Chronic Obstructive Lung Disease (GOLD)[2]

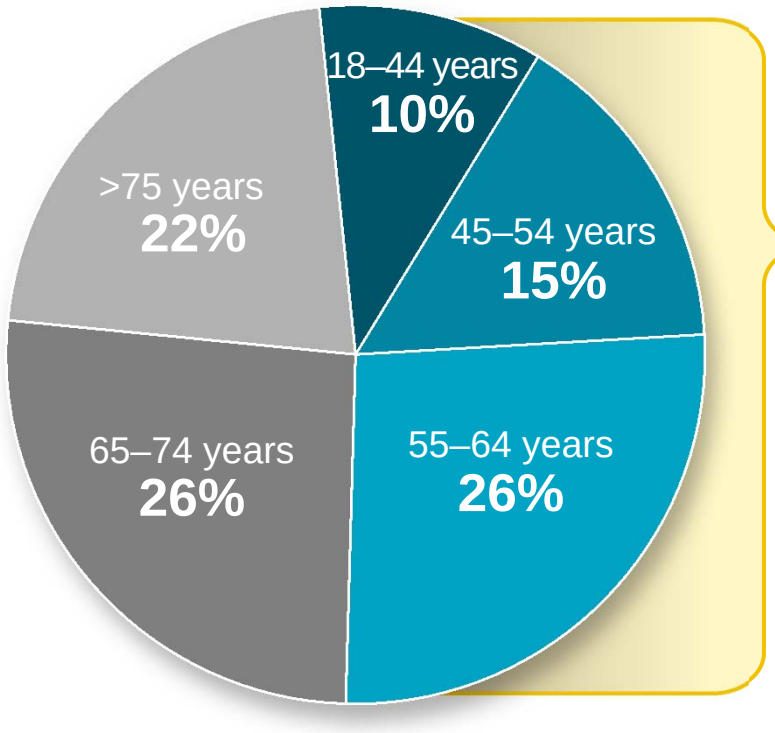
- A common, preventable, and treatable disease
- Characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lungs to noxious particles and gases

1. American Thoracic Society, European Respiratory Society. *Standards for the Diagnosis and Management of Patients With COPD*. 2004. http://www.thoracic.org/clinical/copd-guidelines/resources/copddoc.pdf. Accessed June 5, 2013.
2. Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2014*. http://www.copd.org. Accessed March 5, 2014.

COPD Is a Common Disease Affecting More Than Half of the Patient Population Younger Than Age 65 Years

6.3% of US Adults (an Estimated 15 Million) Have Been Told by a Healthcare Provider That They Have COPD

Age Distribution of COPD[a]



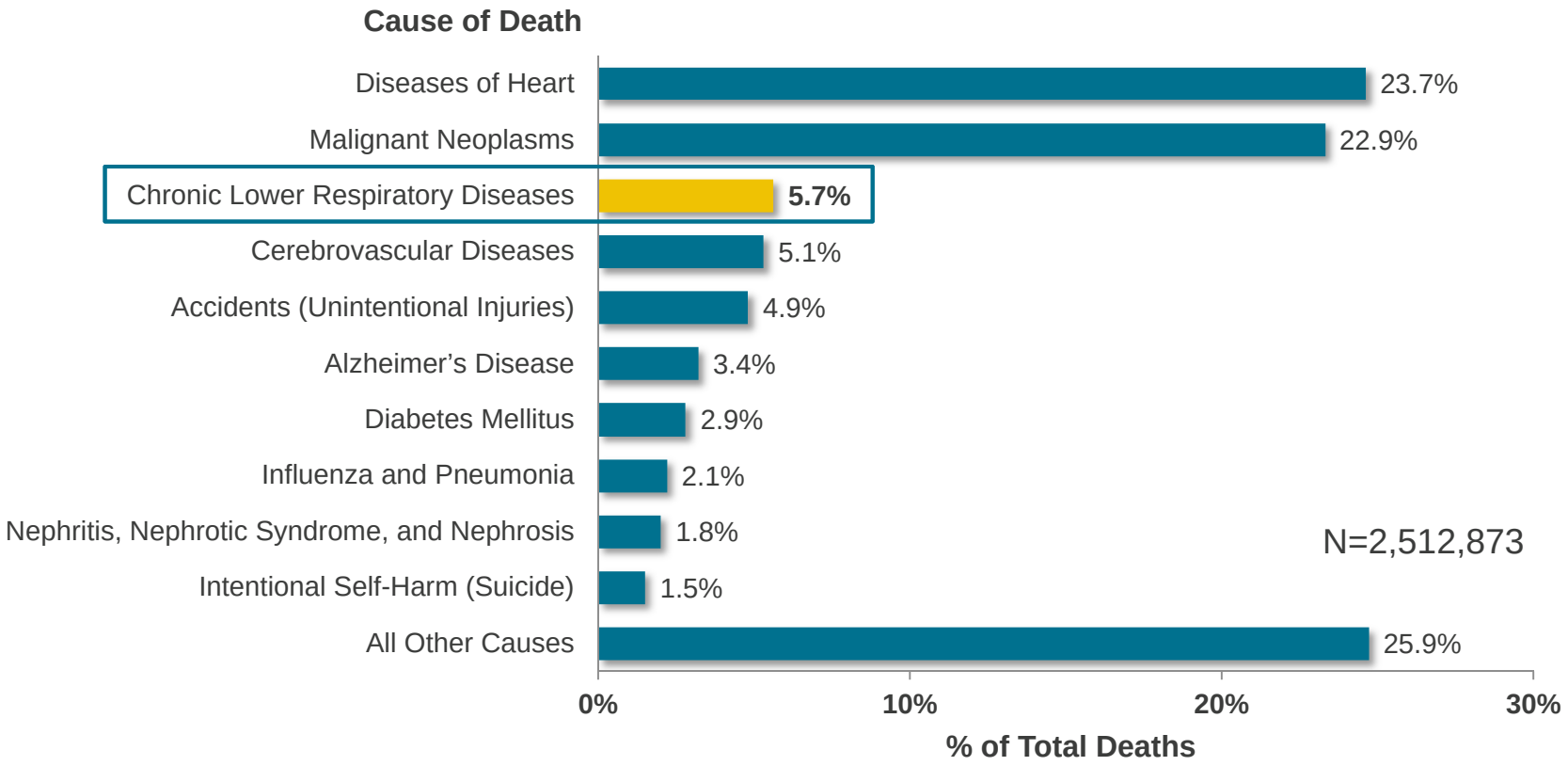
51% of adults are younger than age 65 years

Percentages do not add up to 100 due to rounding.

[a]Values based on percentage of adults reported having ever been told by a physician that they had COPD.

Chronic obstructive pulmonary disease among adults—United States, 2011. *MMWR.* 2012;61(46):938-943.

Chronic Lower Respiratory Diseases Are the Third Leading Cause of Death in the United States

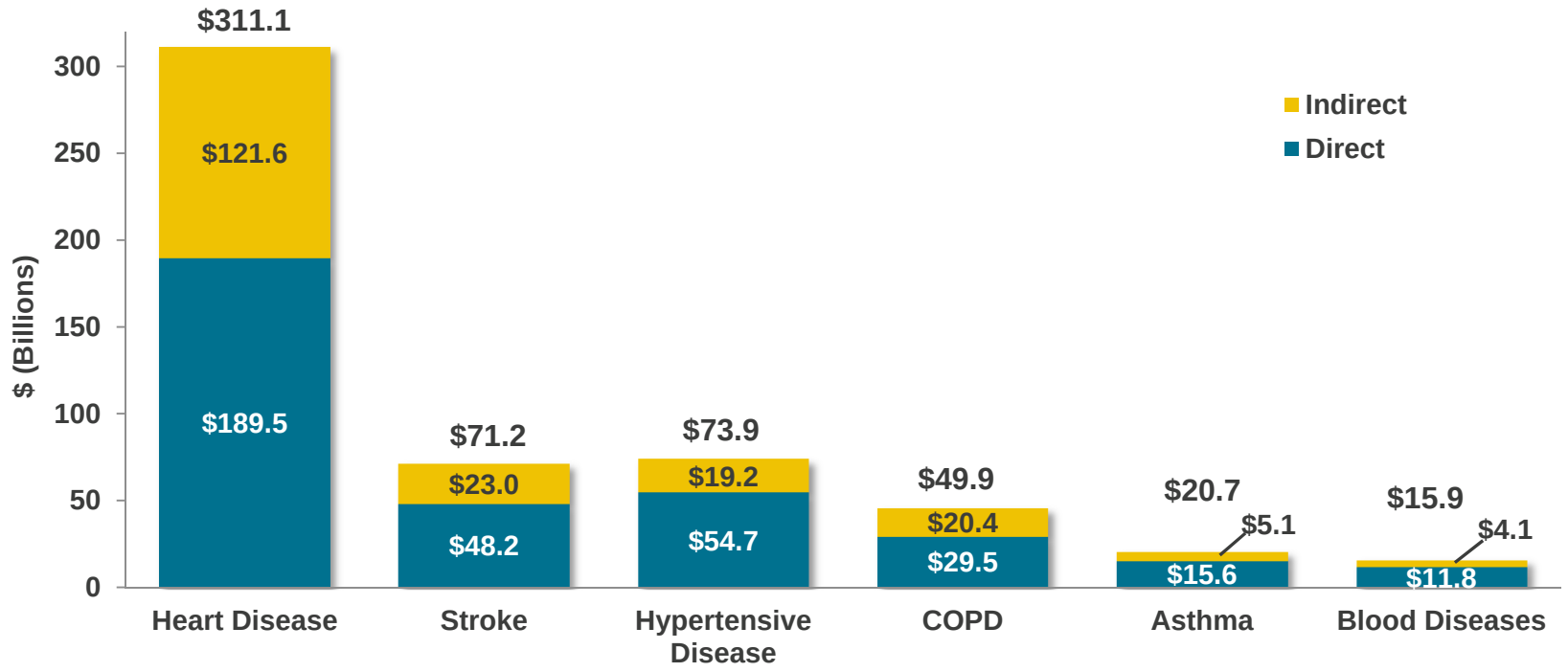


Chronic Lower Respiratory Diseases Include Chronic Bronchitis, Emphysema, COPD, Asthma, or Bronchiectasis

Chronic lower respiratory disease is based on ICD-10 codes: bronchitis, chronic and unspecified (J40–J42); emphysema (J43); asthma (J45–J46); and other lower respiratory diseases (J44,J47).
Hoyert DL, Xu J. Deaths: Preliminary Data for 2011. *National Vital Statistics Reports*. 2012;61(6):1-51. http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_06.pdf.

In 2010, the Projected Economic Burden of COPD Was $49.9 Billion in the United States

2010 Projected Cost Estimates for Cardiovascular, Lung, and Blood Diseases



$13.2 Billion in Projected Direct Medical Costs Are Associated With COPD-related Hospital Care

National Heart, Lung, and Blood Institute. *Morbidity & Mortality: 2009 Chart Book on Cardiovascular, Lung, and Blood Diseases*. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health; 2009.

COPD Exacerbations Can Result in Substantial Economic Burden

Number of Hospitalizations and Costs Associated With Acute Exacerbations of COPD

	Number of Hospitalizations (In 2006, weighted[a])	**Hospitalization Costs** (2010 inflation adjusted)	
		Total	**Mean** (± Standard Deviation)
Acute Exacerbations[b]	1,254,703	$14.05 billion	$11,195 (±$14,895)
Principal Diagnosis of Acute Exacerbations[c]	421,251	$3.47 billion	$8,228 (±$9,722)

STUDY OVERVIEW

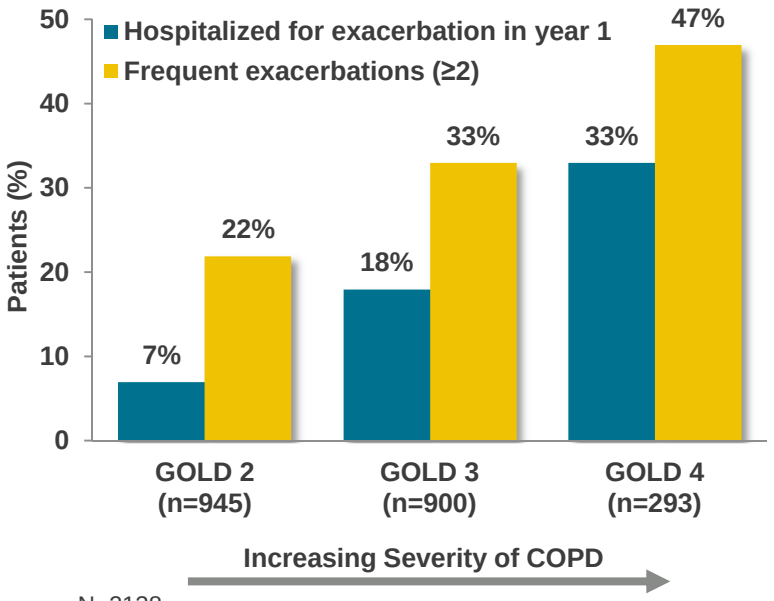
- Retrospective, observational study analyzing inpatient discharge records from the 2006 Healthcare Cost and Utilization Project (HCUP) Nationwide Inpatient Sample (NIS).
- Mean (standard deviation) age was 70.6(±11.9) years. The majority were of white race (83.6%) and female (52.8%); 33.7% belonged to the lowest national income quartile, and the primary payer for the majority of discharges was Medicare or Medicaid (82.7%).
- All inherent limitations of retrospective database analyses were applicable to this study, including coding errors, omissions, and unmeasured confounding factors such as COPD disease severity and smoking status.

[a]Sampling weights applied to approximate national estimates. [b]Inclusion criteria: 1) ICD-9 code for obstructive chronic bronchitis (491.2x); or 2) presence of any other ICD-9 code for COPD (490-492, 494-496) with a concurrent diagnosis for pneumonia (481-486) or, a procedure code for mechanical ventilation (93.90, 96.70, 96.71, 96.72). [c]Inclusion criteria: ICD-9 code 491.21 indicating an acute exacerbation of COPD (AECOPD) in the principal diagnosis position.

Perera PN, Armstrong EP, Sherrill DL, Skrepnek GH. Acute exacerbations of COPD in the United States: inpatient burden and predictors of costs and mortality. *COPD.* 2012;9(2):131-141.

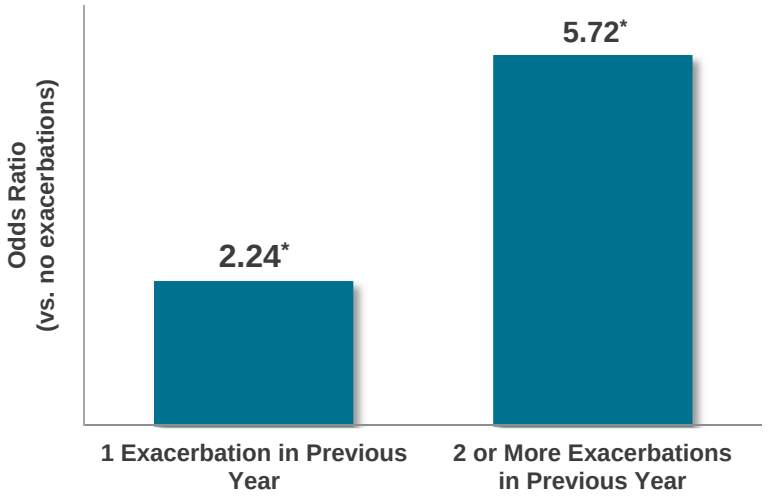
ECLIPSE Study
Susceptibility to Exacerbations in COPD

Proportion of Patients Hospitalized for Exacerbations and With Frequent Exacerbations Increased With Increasing Severity



N=2138

Exacerbation History Was a Significant* Predictor of the Risk for Subsequent Exacerbations



*P<0.001

N=2138

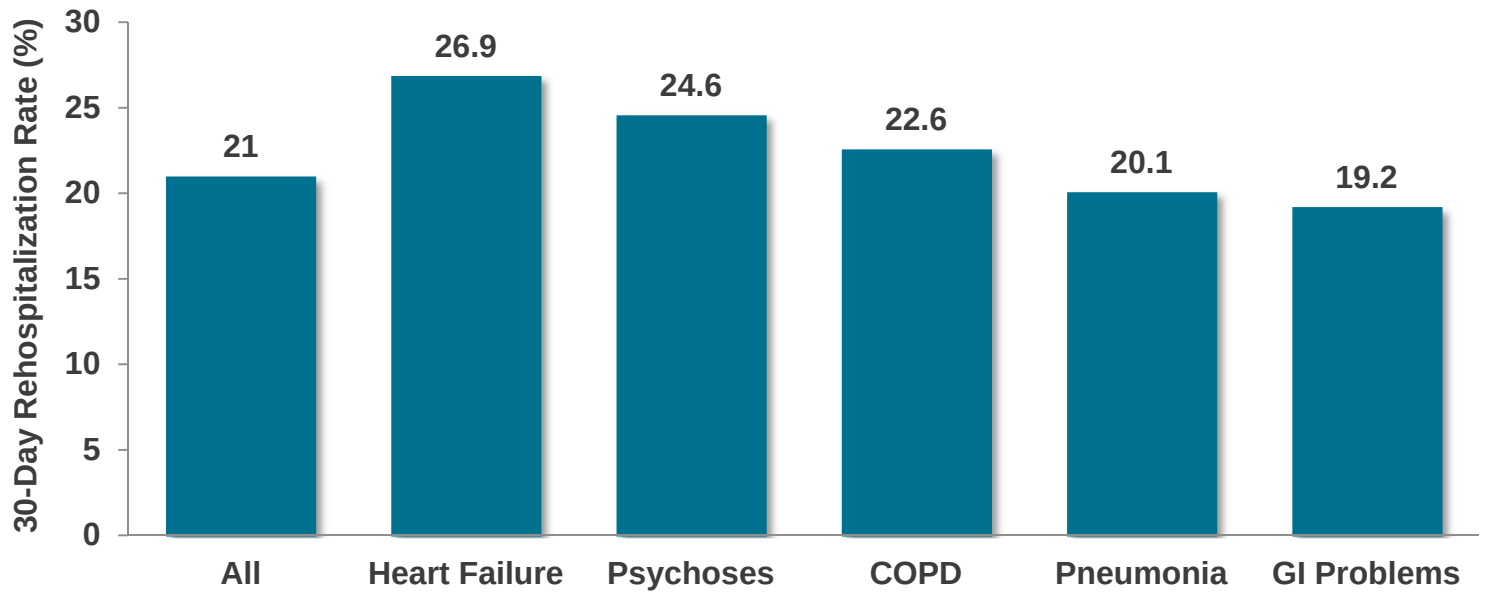
STUDY OVERVIEW

- Prospective observational study (ECLIPSE=The Evaluation of COPD Longitudinally to Identify Predictive Surrogate Endpoints).
- Spirometry and computed tomography (CT) scanning to evaluate emphysema and severity of disease. Severity of COPD was based on GOLD stages: moderate (GOLD 2), severe (GOLD 3), and very severe (GOLD 4).
- Exacerbations: Primary clinician's or study personnel's decision to prescribe antibiotics or systemic corticosteroid, alone or in combination, or events that led to hospitalization (severe exacerbation); frequent exacerbations were defined as ≥2 exacerbations in a year.

Hurst JR, et al. For the Evaluation of COPD Longitudinally to Identify Predictive Surrogate Endpoints (ECLIPSE) Investigators. Susceptibility to exacerbation in chronic obstructive pulmonary disease. *N Engl J Med*. 2010;363(12):1128-1138.

COPD Is Associated With High Rehospitalization Rates

More Than 1 in 5 Patients Discharged With a Diagnosis Code for COPD Are Rehospitalized Within 30 Days



STUDY OVERVIEW

- Retrospective analysis of claims data in a Medicare fee-for-service population of more than 11 million patients using data from the Medicare Provider Analysis and Review (MEDPAR) file for the 15-month period from October 2003 through December 2004.
- Rehospitalization diagnoses were based on diagnosis-related group (DRG) numbers; DRG for COPD was 088.

Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *N Engl J Med.* 2009;360(14):1418-1428.

COPD Modules

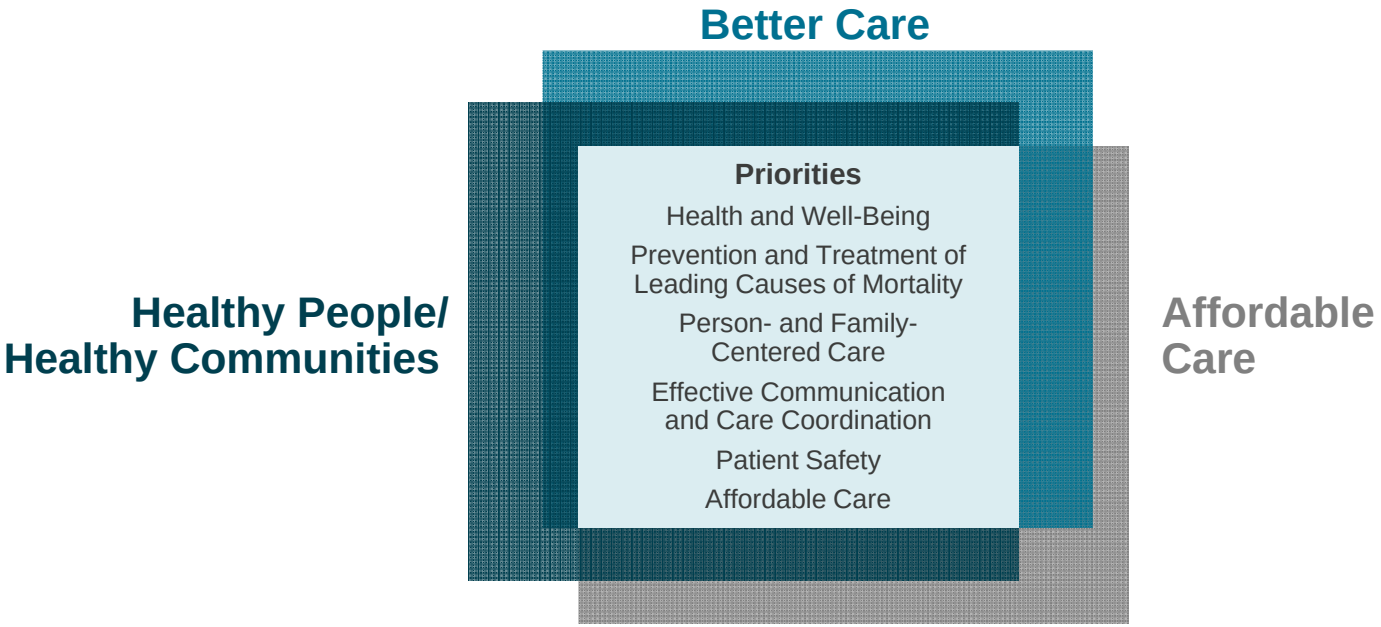
Description, Impact, and Healthcare Burden

National Quality Landscape

Diagnosis and Treatment

The National Quality Strategy (NQS): A Blueprint for Quality Improvement Efforts[1–3]

- In March 2011, the Secretary of the US Department of Health and Human Services established the NQS[1]
- Established 3 broad aims and 6 priorities for quality[2,3]
- Is intended to align the priorities and efforts of governmental and private-sector stakeholders with the goals of improving the quality and reducing the cost of healthcare[2]



1. Press release National Quality Strategy will promote better health, quality care for Americans; March 2011. http://www.hhs.gov/news/press/2011pres/03/20110321a.html. Accessed December 19, 2013.
2. 2013 Annual Progress Report to Congress: National Strategy for Quality Improvement in Health Care. Washington, DC: US Department of Health and Human Services; July 2013. http://www.ahrq.gov/workingforquality/nqs/nqs2013annlrpt.htm#fig2. Accessed September 13, 2013.
3. National Quality Strategy Aims and Priorities. Washington, DC: National Quality Forum; February 2013. http://public.qualityforum.org/Pages/NQF-Chart-Graphics.aspx. Accessed September 13, 2013.

Measuring Healthcare Quality and Performance in COPD[1–5]

- As attention to quality continues to increase, performance measures are becoming a part of the national endeavor to improve the quality of healthcare[1]
- Performance measures endorsed by the National Quality Forum (NQF) have become a common point of reference, reflecting scientific and evidence-based review, input from patients and their families, and the perspectives of the healthcare industry[1]
- The NQF-endorsed measures include those that address COPD specifically and others that include COPD in addition to other conditions (eg, hospital readmissions)[2–5]

1. National Quality Forum. The ABCs of measurement. http://www.qualityforum.org/Measuring_Performance/ABCs/ABCs_of_Measurement.aspx. Accessed March 19, 2013.
2. National Quality Forum. NQF #1893 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization. Last updated April 3, 2014. http://www.qualityforum.org/Qps/QpsTool.aspx (search term=1893). Accessed May 19, 2014.
3. National Quality Forum. NQF #1891 Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization. Last updated April 8, 2014. http://www.qualityforum.org/Qps/QpsTool.aspx (search term=1891). Accessed May 19, 2014.
4. National Quality Measures Clearinghouse. Chronic obstructive pulmonary disease (COPD): the relative resource use by members with COPD during the measurement year. Agency for Healthcare Research and Quality Website. http://qualitymeasures.ahrq.gov/content.aspx?id=34751. Accessed March 19, 2013.
5. Horowitz L, Partovian C, Lin Z, et al. Hospital-wide all-cause unplanned readmission measure. Final technical report. New Haven, CT: Yale New Haven Health Services Corporation/Center for Outcomes Research & Evaluation.Prepared for Centers for Medicare & Medicaid Services (CMS); July 2012.

NQF-Endorsed Performance Measures That Include Focus on Spirometry[1–4]

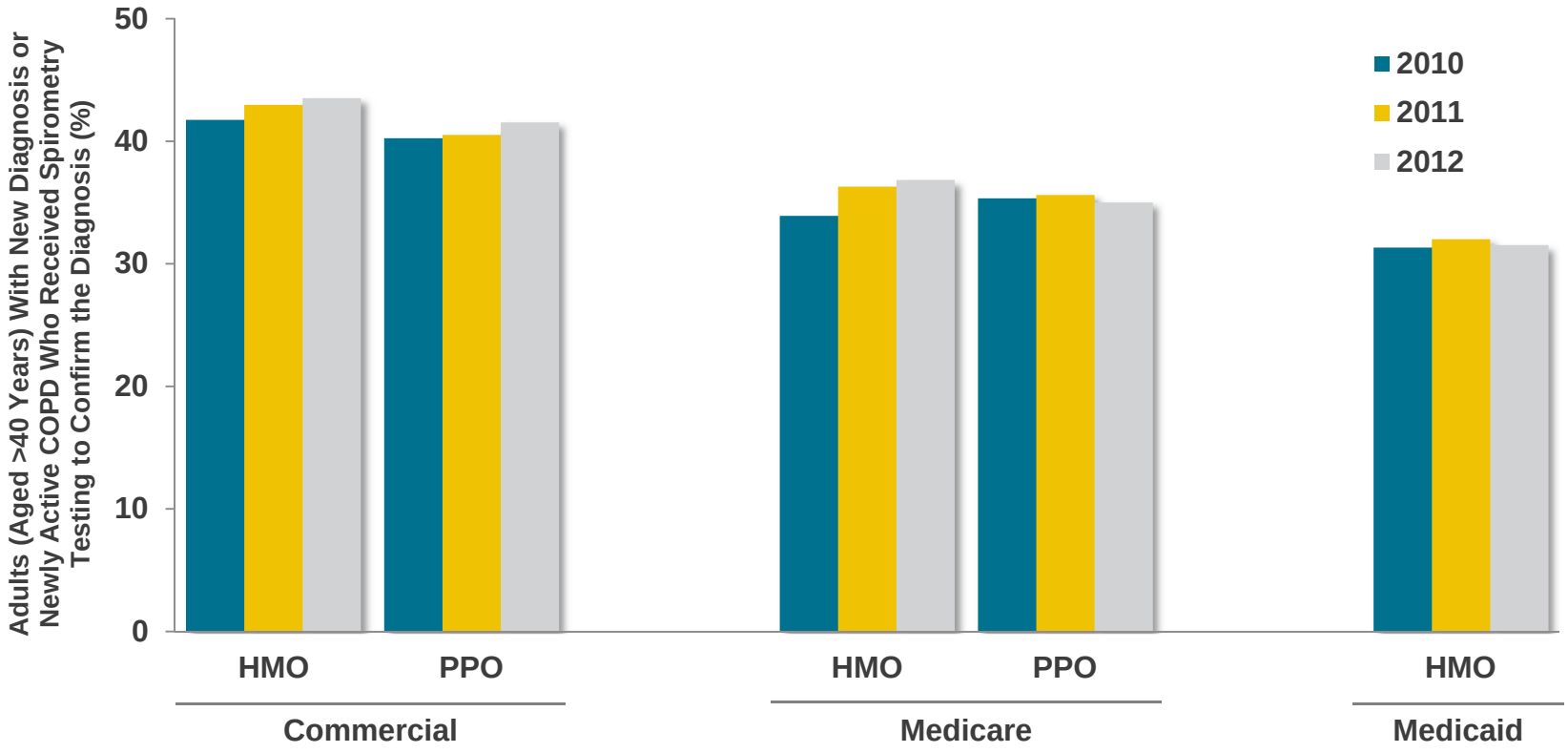
Measure Steward	Measure: Title & Description	Measure Set[a]	Applicable for:
National Committee for Quality Assurance (NCQA)[1]	**Use of Spirometry Testing in the Assessment and Diagnosis of COPD:** The percentage of patients age ≥40 with a new diagnosis of COPD or newly active COPD, who received appropriate spirometry testing to confirm the diagnosis[1]	HEDIS[2]	• Managed care • Medical group practice • Integrated delivery network[b]
American Medical Association-Physician Consortium for Performance Improvement (AMA-PCPI)[3]	**COPD: Spirometry Evaluation:** Percentage of patients aged 18 years and older with a diagnosis of COPD who had spirometry results documented[3]	CMS PQRS[4]	• Medical group practice • Integrated delivery network[b]

[a]Certain organizations (Centers for Medicare and Medicaid Services [CMS], CMS Hospital Readmission Reduction Program [CMS HRRP], CMS Inpatient Quality Reporting [CMS IQR], Health Plan Employer Data and Information [HEDIS], Performance Quality Rating Scale [PQRS]) have aggregated quality and performance measures into sets for the purposes of standardization and data collection. The purpose of this column is to identify where measures have been included in commonly used sets. [b]Integrated Delivery Network=a grouping of healthcare facilities and providers working together to provide treatment to a patient across a continuum of care.

1. National Quality Forum. Use of spirometry testing in the assessment and diagnosis of COPD. Last updated January 6, 2014. http://www.qualityforum.org/Qps/QpsTool.aspx (search term=0577). Accessed May 19, 2014. 2. National Committee for Quality Assurance. HEDIS 2012, Vol. 2. Summary table of measures, product lines and changes. http://www.ncqa.org/Portals/0/HEDISQM/HEDIS%202011/SUMMARY_TABLE_OF_MEASURES _for_HEDIS_2012.pdf. Accessed March 19, 2013. 3. National Quality Forum. Chronic obstructive pulmonary disease (COPD): Percentage of patients aged 18 years and older with a diagnosis of COPD who had spirometry results documented. Last updated: January 30, 2014. http://www.qualityforum.org/Home.aspx (search term=0091). Accessed May 14, 2014. 4. Centers for Medicare and Medicaid Services. 2013 Physician Quality Reporting System (PQRS) Quality-Data Code (QDC) categories. http://www.cms.gov/apps/ama/license.asp?file=/PQRS/downloads/2013_PQRS_IndClaimsRegistry_ MeasureSpec_SupportingDocs_12192012. zip. Updated November 16, 2012. Accessed March 19, 2013.

Percentage of Adults Who Received Spirometry Testing to Confirm the Diagnosis of COPD

NCQA HEDIS Measure:
Use of Spirometry in the Assessment and Diagnosis of COPD



HEDIS=Healthcare Effectiveness Data and Information Set; HMO=health maintenance organization; PPO=preferred provider organization.

Improving Quality and Patient Experience. The State of Health Care Quality 2013. Washington, DC: National Committee for Quality Assurance; 2013.

NQF-Endorsed Performance Measure That Addresses COPD Specifically[1–3]

Measure Steward	Measure: Title & Description	Measure Set[a]	Applicable for:
CMS	**Hospital 30-Day, All-Cause, Risk-Standardized Readmission Rate (RSRR) Following COPD Hospitalization:** Estimates a hospital-level RSRR (readmission for any cause within 30 days after the date of discharge of the index admission) for patients aged ≥40 years discharged from the hospital with either a principal diagnosis of COPD or a principal diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of COPD[1,2,b]	CMS IQR[3,c] CMS HRRP[d]	• Integrated delivery network[e] • Hospital

[a]Certain organizations (Centers for Medicare and Medicaid Services [CMS], CMS Hospital Readmission Reduction Program [CMS HRRP], CMS Inpatient Quality Reporting [CMS IQR], Health Plan Employer Data and Information [HEDIS], Performance Quality Rating Scale [PQRS]) have aggregated quality and performance measures into sets for the purposes of standardization and data collection. The purpose of this column is to identify where measures have been included in commonly used sets. [b] Evidence of recent exacerbations (refer to full technical specifications for details). [c] Added to the CMS IQR Program for calendar year 2014 reporting (fiscal year 2016 payment determination). [d] Added to CMS HRRP in fiscal year 2015 (October 2014 discharges). [e]Integrated Delivery Network=a grouping of healthcare facilities and providers working together to provide treatment to a patient across a continuum of care.

1. National Quality Forum. NQF. Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization. Last updated April 8, 2014. http://www.qualityforum.org/Qps/QpsTool.aspx (search term=1891). Accessed May 19, 2014.
2. *Pulmonary and Critical Care Consensus Standards Endorsement Maintenance. Technical Report.* Washington, DC: National Quality Forum; April 2013. http://www.qualityforum.org/Publications/2013/04/Pulmonary_and_Critical_Care_Consensus_Standards_Endorsement_Maintenance.aspx. Accessed June 14, 2013.
3. CMS final rule to improve quality of care during hospital inpatient stays. US Department of Health and Human Services. Centers for Medicaid and Medicare Services; August 2, 2013. http://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-Sheets/2013-Fact-Sheets-Items/2013-08-02-3.html. Accessed September 5, 2013.

NQF-Endorsed Performance Measures That Include COPD[1–5]

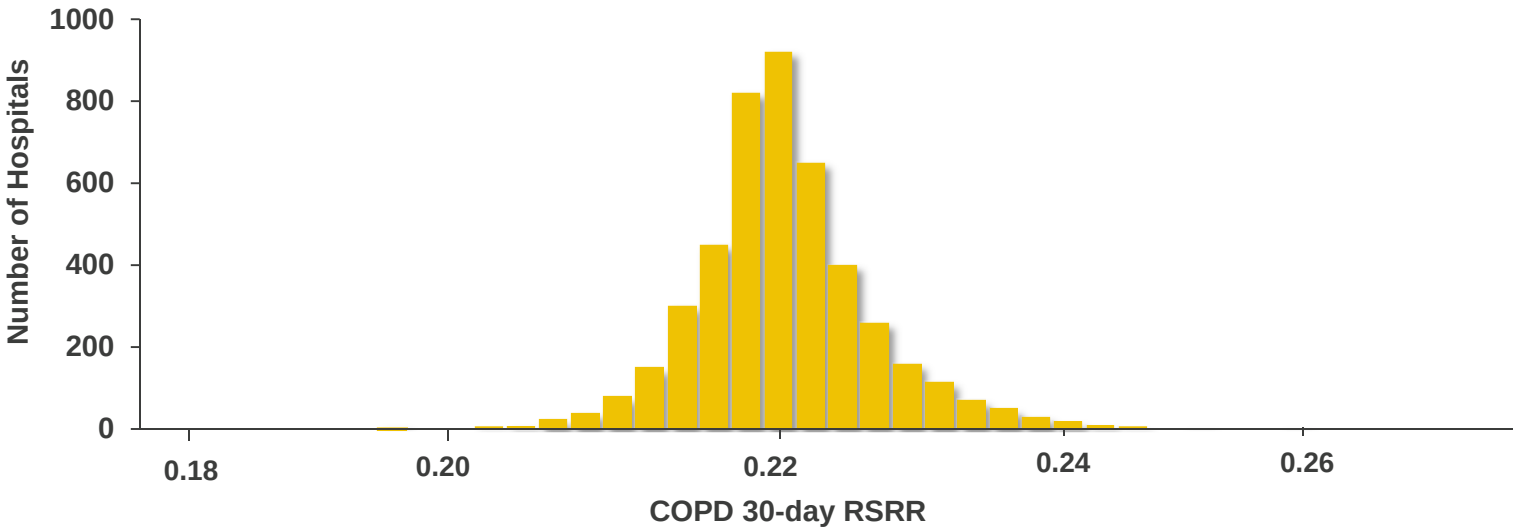
Measure Steward	Measure: Title & Description	Measure Set[a]	Applicable for:
CMS[1]	**Hospital-Wide All-Cause Unplanned Readmission Measure:** Estimates the hospital-level risk-standardized rate of unplanned, all-cause readmission after admission for any eligible condition within 30 days of hospital discharge[1]	CMS IQR[2]	• Integrated delivery network[b] • Hospital
NCQA[3]	**Plan All-Cause Readmission:** Number and rate of acute inpatient stays during the measurement year that were followed by an acute readmission for any diagnosis within 30 days[3]	HEDIS[4] Medicare C Star[5]	• Managed care • Medical group practice • Integrated delivery network[b]

[a]Certain organizations (Centers for Medicare & Medicaid Services [CMS], CMS Hospital Readmission Reduction Program [CMS HRRP], CMS Inpatient Quality Reporting [CMS IQR], Health Plan Employer Data and Information [HEDIS], Performance Quality Rating Scale [PQRS]) have aggregated quality and performance measures into sets for the purposes of standardization and data collection. The purpose of this column is to identify where measures have been included in commonly used sets. [b]Integrated Delivery Network=a grouping of healthcare facilities and providers working together to provide treatment to a patient across a continuum of care.

1. Horowitz L, Partovian C, Lin Z, et al. Hospital-wide all-cause unplanned readmission measure. Final technical report. New Haven, CT: Yale New Haven Health Services Corporation/Center for Outcomes Research & Evaluation. Prepared for Centers for Medicare & Medicaid Services (CMS); July 2012. 2. Department of Health and Human Services. Rules and regulations. Federal Register. 2012;77(170):53258-53750. 3. National Committee for Quality Assurance. *2012 Insights for Improvement: Reducing Readmissions: Measuring Health Plan Performance*. Washington, DC; 2012. 4. National Committee for Quality Assurance. HEDIS 2012, Vol. 2. Summary table of measures, product lines and changes. http://www.ncqa.org/Portals/0/HEDISQM/HEDIS%202011/ SUMMARY_TABLE_OF_MEASURES_for_HEDIS_2012.pdf. Accessed March 19, 2013. 5. Centers for Medicare & Medicaid Services. Medicare health and drug plan quality and performance ratings 2013 Part C & Part D technical notes. http://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/Downloads/Technical-Notes-2013-.pdf.

COPD Readmissions in Medicare: An Opportunity for Improvement

- National unadjusted COPD* readmission rate: 21.84%
- CMS-defined hospital RSRR mean (range): 22.0% (18.33%–25.03%)



STUDY OVERVIEW

- Medicare fee-for-service patients aged ≥65 admitted for acute exacerbation of COPD (or admitted for respiratory failure with secondary diagnosis of acute exacerbation of COPD) in 2008 were used to calculate rehospitalization rates using hierarchical logistic regression models.

*Diagnosis of aforementioned conditions were based on ICD-9-CM codes to identify acute exacerbations of COPD (491.21, 491.22, 491.8, 491.9, 492.8, 493.20, 493.21, 493.22, 496) and respiratory failure (518.81, 518.82, 518.84,799.1).

Grosso LM, Lindenauer P, Wang C, et al. *Hospital-level 30-day Readmissions Following Admission for an Acute Exacerbation of Chronic Obstructive Pulmonary Disease*. Measure methodology report. New Haven, CT: Yale New Haven Health Services Corporation/Center for Outcomes Research & Evaluation. Prepared for Centers for Medicare & Medicaid Services (CMS); September 29, 2011.

Overview of the Reengineered Discharge (RED) Program

In-Hospital Component (Discharge Advocate)*

- **Educate patient** about relevant diagnoses throughout hospital stay
- **Make appointments** for clinician follow-up and postdischarge testing
- **Confirm medication plan** and compare it with national guidelines and critical pathways
- **Transmit discharge summary** to physicians and services accepting responsibilities of patient's care
- **Assess the degree of understanding** by asking the patient to explain, in his or her own words, the details of the plan (this may require contacting family members who will share in the caregiving responsibilities)

After-Hospital Care Plan

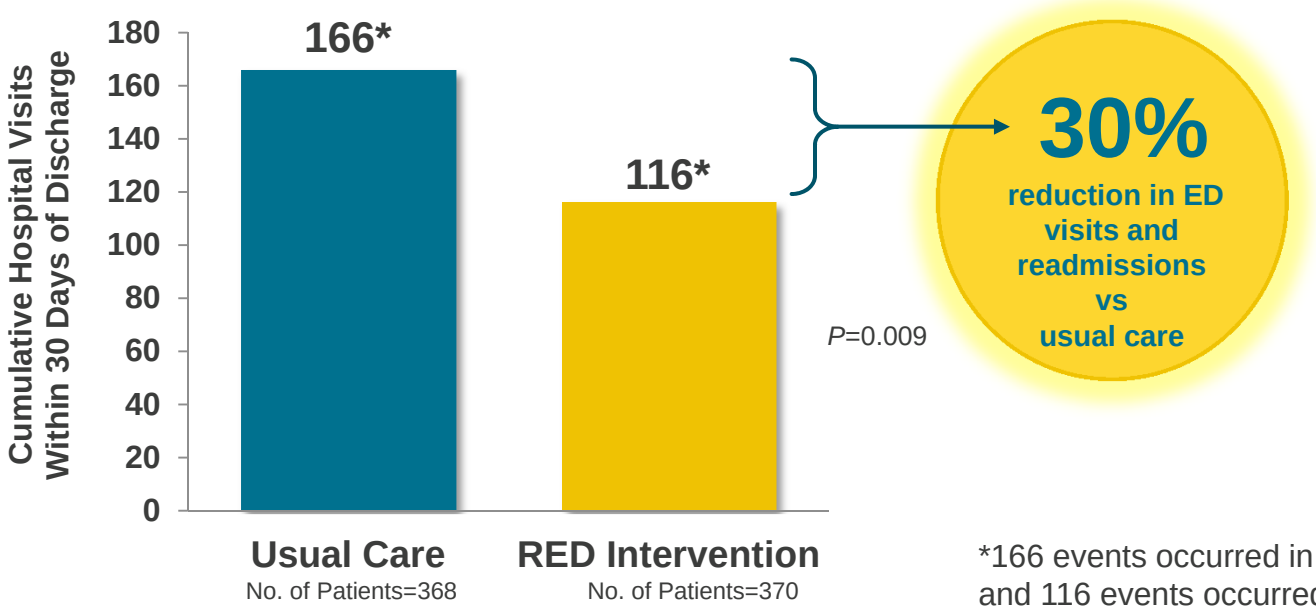
- **Give the patient a written discharge plan** at the time of discharge
- **Pharmacist call the patient** to reinforce discharge plan, review medications, and solve problems

*Not an all-inclusive list.

Jack BW, Chetty VK, Anthony D, et al. A reengineered hospital discharge program to decrease rehospitalization: a randomized clinical trial. *Ann Intern Med*. 2009;150(3):178–187.

A Structured Discharge Program Might Help Reduce Hospital Readmissions

A 22-month study at a single academic center in Boston showed that, compared with usual care, implementation of a RED program reduced hospital utilization (emergency department [ED] visits and inpatient hospital readmissions) in a general medical population within 30 days of discharge



*166 events occurred in 99 of 368 patients, and 116 events occurred in 80 of 370 patients.

STUDY OVERVIEW

- Randomized trial at a general medical service in an urban, academic, safety-net hospital from January 2006 – October 2007.
- Primary outcomes were ED visits and hospitalizations within 30 days of discharge.

Jack BW, Chetty VK, Anthony D, et al. A reengineered hospital discharge program to decrease rehospitalization: a randomized clinical trial. *Ann Intern Med*. 2009;150(3):178-187.

COPD Modules

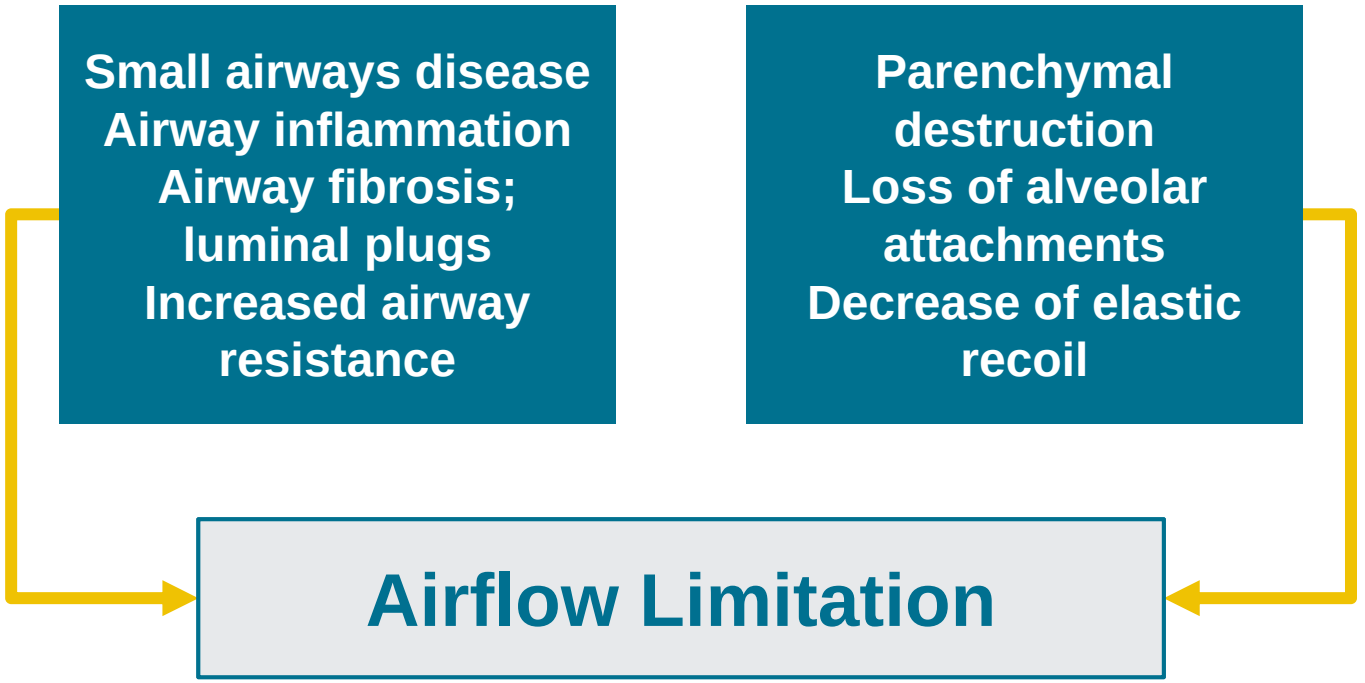
Description, Impact, and Healthcare Burden

National Quality Landscape

Diagnosis and Treatment

Pathophysiology of COPD

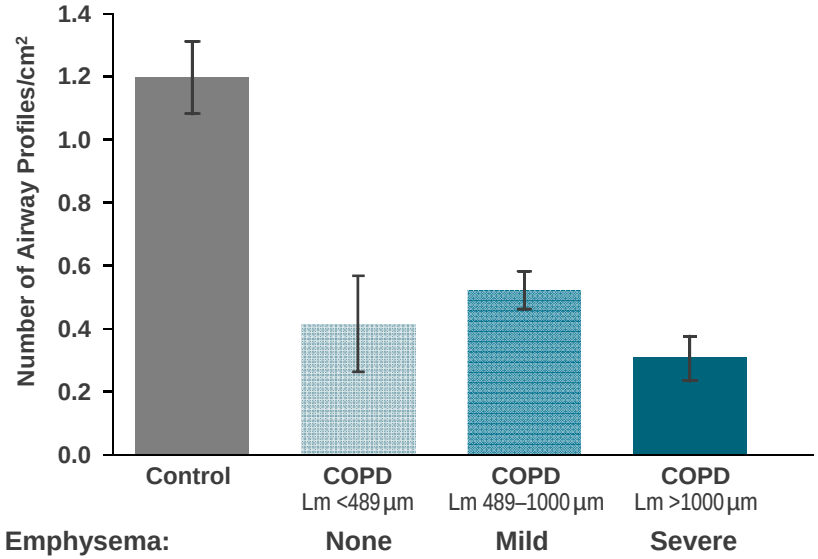
Mechanisms Underlying Airflow Limitation in COPD



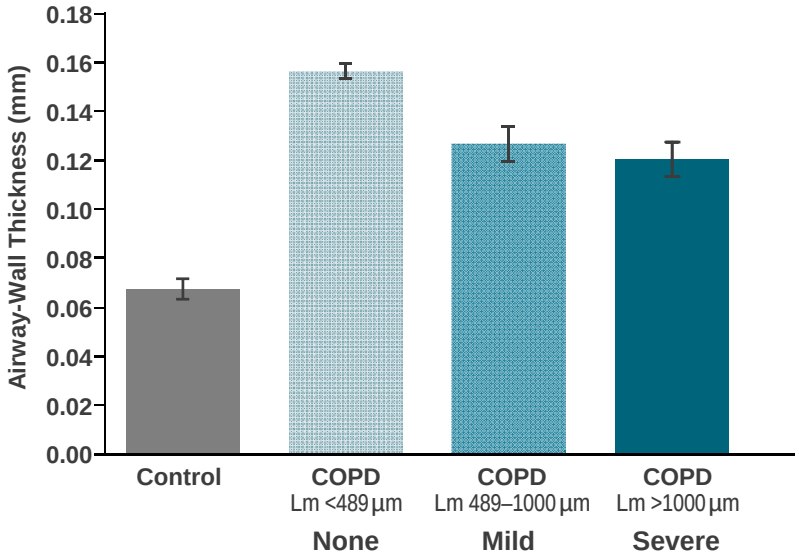
Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2014*. http://www.copd.org. Accessed March 5, 2014.

Airway Profiles and Airway Wall Thickness According to the Extent of Emphysema in COPD

Reduction in Total Number of Terminal Airways



Walls of Surviving Terminal Airways Thicken



Loss of Terminal Airways and Wall Thickening of Surviving Airways Develop Before Emphysema Is Detectable and These Changes Are Irreversible

STUDY OVERVIEW

- Study subjects included 78 individuals with varying degrees of COPD severity, 14 lungs from 12 individuals undergoing transplantation for severe COPD, and 4 control lungs.
- Multidetector computed tomography (CT) was used to count the number of airways measuring 2.0 to 2.5 mm.
- Microcomputed tomography (microCT) was used to measure the extent of emphysema (mean linear intercept), the number of terminal bronchioles per milliliter of lung volume, and the minimum diameters and cross-sectional areas of terminal bronchioles.

Lm=mean linear intercept, which is a measure of alveolar size; larger values indicate more severe emphysema. For control lungs, Lm <489 µm.

Figures reproduced from McDonough J, Yuan R, Suzuki M, et al. Small-airway obstruction and emphysema in chronic obstructive pulmonary disease. *N Engl J Med*. 2011;365(17):1567-1575, with permission from the Massachusetts Medical Society.

By the Time COPD Is Diagnosed…

Lung Function Can Be Reduced By More Than 60%

No bronchodilator therapy has been shown to reduce the rate of decline in FEV_1, but bronchodilators can improve lung function in patients with COPD

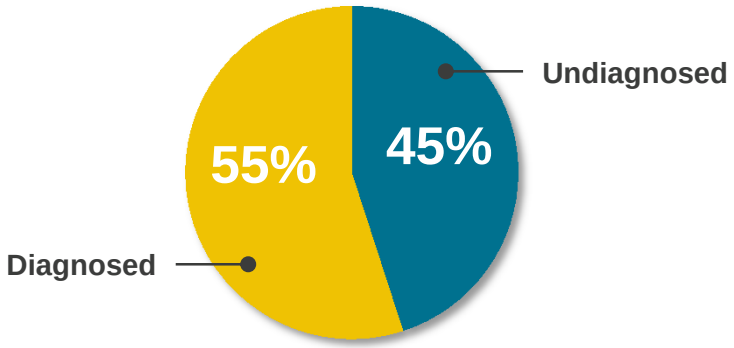
FEV_1=forced expiratory volume in the first second.

Figure reproduced from http://www.istockphoto.com/stock-photo-3910718-lung-infection.php?st=fb9419d with permission from iStockphoto LP.

Lindberg A, Bjerg-Bäcklund A, Rönmark E, Larsson LG, Lundbäck B. Prevalence and underdiagnosis of COPD by disease severity and the attributable fraction of smoking: report from the Obstructive Lung Disease in Northern Sweden Studies. *Respir Med.* 2006;100(2):264-272..

COPD Is Underdiagnosed[1,2]

- Of the 26.8 million Americans estimated to have COPD, 45% are believed to remain undiagnosed[1]



- In a population-based study in Sweden, only half of the patients with FEV_1 <40% of predicted were diagnosed by a physician with chronic bronchitis, emphysema, or COPD[2]

STUDY OVERVIEW[2]

- Confirmation of diagnosis evaluated through a structured interview and lung function (with a dry spirometer) tests performed in 1500 subjects living in the northernmost province of Sweden.

FEV_1=forced expiratory volume in the first second.

1. National Heart, Lung, and Blood Institute. Morbidity and Mortality: 2012 Chart Book on Cardiovascular, Lung, and Blood Diseases. http://www.nhlbi.nih.gov/resources/docs/2012_ChartBook_508.pdf. Accessed May 31, 2013.
2. Lindberg A, Bjerg-Bäcklund A, Rönmark E, Larsson LG, Lundbäck B. Prevalence and underdiagnosis of COPD by disease severity and the attributable fraction of smoking: report from the Obstructive Lung Disease in Northern Sweden Studies. *Respir Med*. 2006;100(2):264-272.

In 1 Study, More Than Half of COPD Patients Reported a Prior Diagnosis of Asthma

597 recruited patients reported a prior diagnosis of either chronic bronchitis or emphysema

Spirometry performed in these 597 patients to determine whether they had obstructive airway disease consistent with COPD

Spirometry identified COPD in 235 patients (39.4%)

Prior Reported Diagnosis in Patients With Spirometry-Based Diagnosis of COPD (n=235)

- Asthma without chronic bronchitis or emphysema n=121 (51.5%)
- Chronic bronchitis or emphysema n=89 (37.9%)
- No obstructive lung disease n=25 (10.6%)

STUDY OVERVIEW

- Prospective study involving patients aged ≥40 years from primary care practices in Aberdeen, Scotland, and Denver, Colorado, with prior evidence of obstructive lung disease defined by lifetime prior diagnosis of asthma or COPD or receipt of any respiratory medications.

Tinkelman DG, Price DB, Nordyke RJ, Halbert RJ. Misdiagnosis of COPD and asthma in primary care patients 40 years of age and over. *J Asthma.* 2006;43(1):75-80.

Risk Factors for COPD

Cigarette Smoking Is the Most Commonly Encountered Risk Factor for COPD

Additional Risk Factors

- Secondhand smoke
- Occupational exposures
- Indoor air pollution
- Genes
- Age and/or gender
- Lung growth and development
- Socioeconomic status
- Infection
- Asthma/bronchial hyperreactivity
- Chronic bronchitis

Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease (2014)*. http://www.goldcopd.org. Accessed March 5, 2014.

Diagnosing COPD Involves Assessment of Symptoms

Common Symptoms of COPD

- Dyspnea that is:
  - Progressive
  - Characteristically worse with exercise
  - Persistent
- Chronic cough—may be intermittent and/or unproductive
- Chronic sputum production

Spirometry Testing Is Required in Patients With Dyspnea, Chronic Cough or Sputum Production, and a History of Exposure to Risk Factors for the Disease

Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease (2014)*. http://www.goldcopd.org. Accessed March 5, 2014.

Spirometry Is Required for the Diagnosis of COPD[1,2]

- Airflow limitation is best measured by spirometry, as this is the most widely available, reproducible test of lung function[1]
  - Measures FVC,[a] FEV_1[b] and the ratio of these 2 measurements (FEV_1/FVC)
- The presence of a postbronchodilator FEV_1/FVC <0.70 confirms the presence of persistent airflow limitation and thus of COPD[1]
  - Measurements are evaluated by comparison with reference values based on age, height, sex, and race

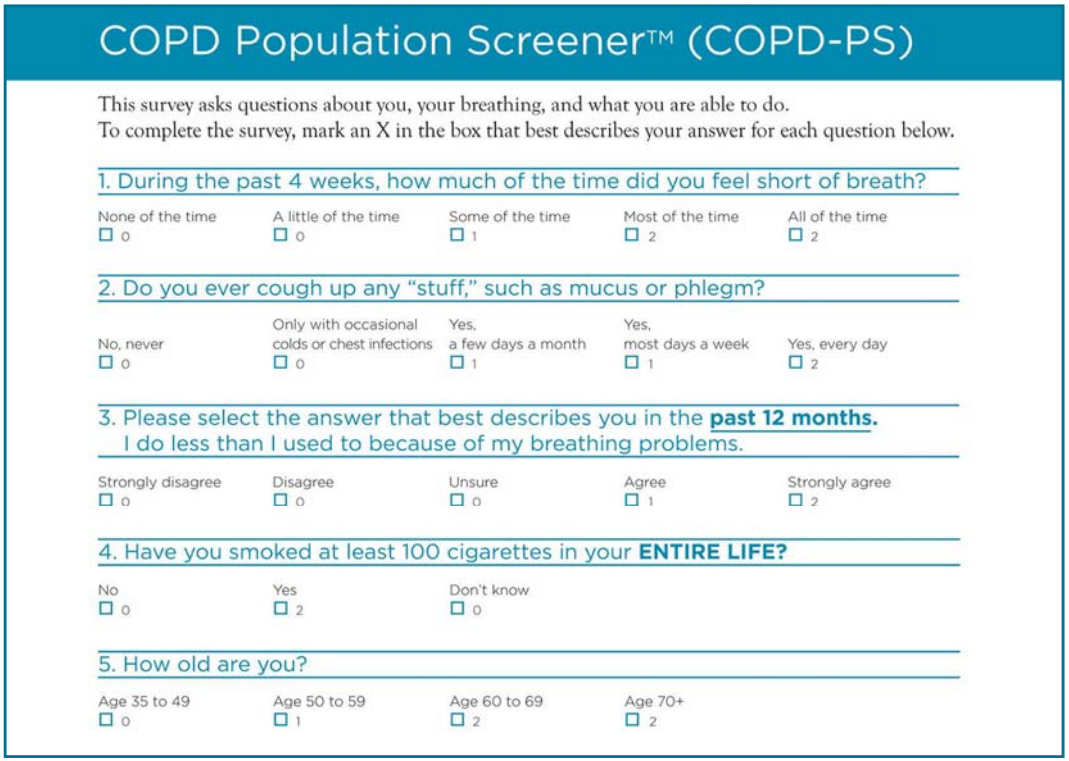
Both Global Initiative for Chronic Obstructive Lung Disease (GOLD) and American Thoracic Society (ATS)/European Respiratory Society (ERS) Require Spirometry to Confirm a Diagnosis of COPD[1,2]

[a]Volume of air forcibly exhaled from the point of maximal inspiration.
[b]Volume of air expelled in the first second of this maneuver.

1. Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease (2014).* http://www.goldcopd.org. Accessed March 5, 2014.
2. Celli BR, MacNee W, and ATS/ERS Task Force committee members. Standards for the diagnosis and treatment of patients with COPD: a summary of the ATS/ERS position paper. *Eur Respir J*. 2004;23(6):932-946.

COPD Population Screener™ (COPD-PS)

- COPD Population Screener uses 5 clinical characteristics to identify patients at risk for airflow obstruction
- This tool may lead to:
  - Increased awareness of COPD
  - Use of spirometry or accurate diagnosis



COPD Population Screener™ (COPD-PS)

This survey asks questions about you, your breathing, and what you are able to do.
To complete the survey, mark an X in the box that best describes your answer for each question below.

1. During the past 4 weeks, how much of the time did you feel short of breath?

None of the time	A little of the time	Some of the time	Most of the time	All of the time
☐ 0	☐ 0	☐ 1	☐ 2	☐ 2

2. Do you ever cough up any "stuff," such as mucus or phlegm?

No, never	Only with occasional colds or chest infections	Yes, a few days a month	Yes, most days a week	Yes, every day
☐ 0	☐ 0	☐ 1	☐ 1	☐ 2

3. Please select the answer that best describes you in the past 12 months. I do less than I used to because of my breathing problems.

Strongly disagree	Disagree	Unsure	Agree	Strongly agree
☐ 0	☐ 0	☐ 0	☐ 1	☐ 2

4. Have you smoked at least 100 cigarettes in your ENTIRE LIFE?

No	Yes	Don't know
☐ 0	☐ 2	☐ 0

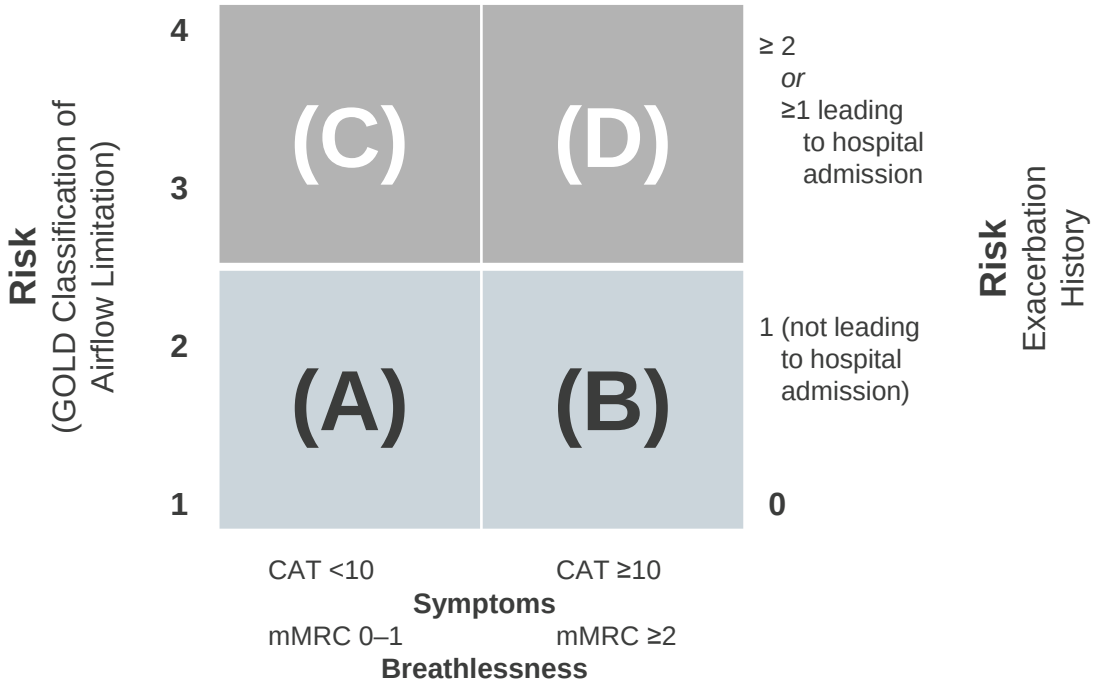
5. How old are you?

Age 35 to 49	Age 50 to 59	Age 60 to 69	Age 70+
☐ 0	☐ 1	☐ 2	☐ 2

Martinez FJ, Raczek AE, Seifer FD, et al. Development and initial validation of a self-scored COPD Population Screener questionnaire (COPD-PS). *COPD.* 2008;5(3):85-95.

Assessment Using Symptoms, Breathlessness, Spirometric Classification, and Risk of Exacerbations

When assessing exacerbation risk, choose the highest risk according to GOLD spirometric classification (GOLD 3 or 4 indicates high risk), exacerbation history (>2 COPD exacerbations in the preceding year indicating high risk), and history for hospitalization due to an exacerbation in the preceding year



CAT=COPD Assessment Test; mMRC=The Modified Medical Research Council Dyspnea Scale. The COPD Control Questionnaire (CCQ), a brief, easy-to-complete questionnaire is also used to evaluate COPD in Individuals with the disease.

Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2014*. http://www.copd.org. Accessed March 5, 2014.

Classification of Severity of Airflow Limitation in COPD (Based on Postbronchodilator FEV_1)

In Patients with FEV_1/FVC <0.70:

GOLD 1	Mild	FEV_1>80%, predicted
GOLD 2	Moderate	50% ≤FEV_1 <80% predicted
GOLD 3	Severe	30% ≤FEV_1 <50% predicted
GOLD 4	Very Severe	FEV_1 <30% predicted

FEV_1=forced expiratory volume in the first second.

Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2014*. http://www.copd.org. Accessed March 5, 2014.

Nonpharmacologic Management of Stable COPD

Nonpharmacologic Management of COPD According to Individualized Assessment of Symptoms and Exacerbation Risk

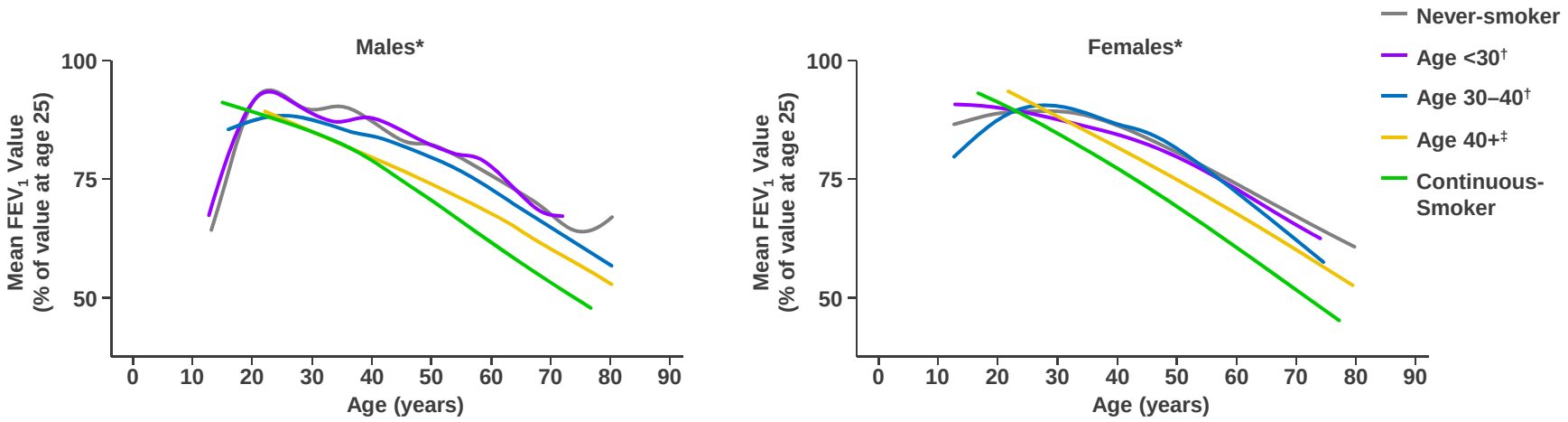
Patient Group	Essential	Recommended	Depending on Local Guidelines
A	Smoking cessation (can include pharmacologic treatment)	Physical activity	Flu vaccination Pneumococcal vaccination
B – D	Smoking cessation (can include pharmacologic treatment) Pulmonary rehabilitation	Physical activity	Flu vaccination Pneumococcal vaccination

According to GOLD 2014, Smoking Cessation Should Be Considered the Most Important Intervention for All COPD Patients Who Smoke Regardless of the Level of Disease Severity

Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2014*. http://www.copd.org. Accessed March 5, 2014.

Effects of Smoking on Decline of Lung Function With Increasing Age

Smoking cessation at age <30 years is associated with a reduced rate of decline in FEV_1.



Mean FEV_1 decline values (95% CI):		
Age <30	15.5 mL (11.3–19.8)	10.4 mL (6.3–14.5)
Age 30–40	24.0 mL (20.0–28.1)	16.5 mL (14.0–19.0)
Age 40+	28.9 mL (26.4–31.1)	21.0 mL (18.8–23.2)

STUDY OVERVIEW

- Prospective cohort with ≥2 valid spirometry measurements during follow-up (N=4391; age range at baseline 13 to 71 years), with a median follow-up time of 23 years.
- Objectives: To describe lung function changes in healthy never-smoking males and females, from adolescence to old age, and to determine the effects of smoking and those derived from quitting.

*Mean FEV_1 values by age in smokers who quit smoking at various ages compared with healthy never-smokers and continuous-smokers.

Kohansal R, Martinez-Camblor P, Agustí A, et al. The natural history of chronic airflow obstruction revisited. *Am J Respir Crit Care Med.* 2009;180(1):3-10.

Initial Pharmacologic Management of COPD[a] Based on GOLD Report

Patient Group	Recommended First Choice	Alternative Choice	Other Possible Treatments[b]
A	Short-acting anticholinergic prn *or* short-acting β_2-agonist prn	Long-acting anticholinergic *or* Long-acting β_2-agonist *or* Short-acting β_2-agonist and short-acting anticholinergic	Theophylline
B	Long-acting anticholinergic *or* Long-acting β_2-agonist	Long-acting anticholinergic and long-acting β_2-agonist	Short-acting β_2-agonist *and/or* Short-acting anticholinergic Theophylline
C	Inhaled corticosteroid + long-acting β_2-agonist *or* Long-acting anticholinergic	Long-acting anticholinergic and long-acting β_2-agonist *or* Long-acting anticholinergic and phosphodiesterase-4 inhibitor *or* Long-acting β_2-agonist and phosphodiesterase-4 inhibitor	Short-acting β_2-agonist *and/or* Short-acting anticholinergic Theophylline
D	Inhaled corticosteroid + long-acting β_2-agonist *and/or* Long-acting anticholinergic	Inhaled corticosteroid + long-acting β_2-agonist and long-acting anticholinergic *or* Inhaled corticosteroid + long-acting β_2-agonist and phosphodiesterase-4 inhibitor *or* Long-acting anticholinergic and long-acting β_2-agonist *or* Long-acting anticholinergic and phosphodiesterase-4 inhibitor	Carbocysteine Short-acting β_2-agonist *and/or* Short-acting anticholinergic Theophylline

[a]Medications in each box are mentioned in alphabetical order and, therefore, not necessarily in order of preference.
[b]Medications in this column can be used alone or in combination with other options in the Recommended First Choice and Alternative Choice columns

Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2014*. http://www.copd.org. Accessed March 5, 2014.

Summary[1–6]

- COPD is a common, preventable, and treatable disease characterized by persistent, progressive airflow limitation.[1]
- Economic burden of COPD is significant in the United States: 2010 projected cost estimate, $49.9 billion.[2]
- Susceptibility to COPD exacerbations correlates with the severity of COPD[3]; exacerbations can be expensive.[4]
- COPD is associated with high rehospitalization rates[5]; in 2015, the Centers for Medicare & Medicaid Services (CMS) will financially penalize hospitals with excessive 30-day readmissions for COPD.[6]
- GOLD provides recommendations for initial pharmacologic therapy for COPD, as well as alternative choice and other possible treatments.[1]
  - Long-acting anticholinergics are included as an appropriate maintenance treatment option across all 4 patient groups (A–D, GOLD 2014). For Group A patients, long-acting anticholinergics are an alternative choice.[1]

1. Global Initiative for Chronic Obstructive Lung Disease. *Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2014*. http://www.copd.org. Accessed March 5, 2014.
2. National Heart, Lung, and Blood Institute. *Morbidity & Mortality: 2009 Chart Book on Cardiovascular, Lung, and Blood Diseases*. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health; 2009. 3. Hurst JR, Vestbo J, Anzueto A, et al. For the Evaluation of COPD Longitudinally to Identify Predictive Surrogate Endpoints (ECLIPSE) Investigators. Susceptibility to exacerbation in chronic obstructive pulmonary disease. *N Engl J Med*. 2010;363(12):1128-1138. 4. Perera PN, Armstrong EP, Sherrill DL, Skrepnek GH. Acute exacerbations of COPD in the United States: inpatient burden and predictors of costs and mortality. *COPD.* 2012;9(2):131-141. 5. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *N Engl J Med.* 2009;360(14):1418-1428. 6. National Quality Forum. Quality Positioning System. Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following chronic obstructive pulmonary disease (COPD) hospitalization. National Quality Forum web site. http://www.qualityforum.org/Home.aspx. Accessed August 8, 2013.

Appendix

Components of RED

In-hospital component (discharge advocate)

1. **Educate patient about relevant diagnoses throughout hospital stay**
2. **Make appointments for clinician follow-up and postdischarge testing**
   - Solicit input from patient about convenient date(s) and time(s) for appointments
   - Coordinate appointments with physicians, testing, and other services
   - Discuss reason for and importance of physician appointments
   - Confirm that patient knows location and transportation plan and review barriers to keeping appointments
3. **Discuss with patient any pending in-hospital tests or studies completed and who will follow-up with results**
4. **Organize postdischarge services**
   - Be sure patient understands the importance of such services
   - Make appointments at times convenient for patient
   - Discuss the details about how to receive each service
5. **Confirm medication plan**
   - Reconcile the discharge medication regimen
   - Explain what medications to take, emphasizing any changes in the regimen
   - Review each medication's purpose, how to take it correctly, and important side effects
   - Be sure the patient has a realistic plan about how to obtain medication.
6. **Reconcile the discharge plan with national guidelines and critical pathways**
7. **Review appropriate steps for what to do if a problem arises**
   - Instruct how to contact the primary care provider (or coverage) by providing contact numbers for evenings and weekends
   - Instruct on what constitutes an emergency and what to do in the case of an emergency

Jack BW, Chetty VK, Anthony D, et al. A reengineered hospital discharge program to decrease rehospitalization: a randomized clinical trial. *Ann Intern Med.* 2009;150(3):178–187.

Components of RED (cont'd)

In-hospital component (discharge advocate) cont'd

8. Transmit discharge summary to physicians and services accepting responsibility of patient's care that contains the following:

- Reason for hospitalization with specific principal diagnosis
- Important findings
- Procedures done and care, treatment, and services provided to patient
- Patient's condition at discharge
- Complete and reconciled medication list (including allergies)
- List of acute medical issues, tests, and studies for which confirmed results are pending at the time of discharge and require follow-up
- Information about input from consultative services, including rehabilitation therapy
- When creating this document, the original source documents— laboratory, radiology, operative reports, and medication administration records—should be in the transcriber's immediate possession and be visible when it is necessary to transcribe information from 1 document to another

9. Assess the degree of understanding by asking the patient to explain in his or her own words the details of the plan

- May require contacting family members who will share in the caregiving responsibilities

After-hospital care plan

10. Give the patient a written discharge plan at the time of discharge that contains the following:

- Reason for hospitalization (discharge diagnosis and significant comorbid conditions)
- Discharge medication list (how and when to take each medication and how to obtain medication)
- Contact information and picture of primary care provider and discharge advocate
- Information for follow-up primary care, specialty care, and outpatient test appointments
- Calendar, labeled with scheduled appointments and tests
- Information for tests and studies for which confirmed results are not available at the time of discharge

Pharmacist postdischarge telephone component

11. Call the patient to reinforce discharge plan, review medications, and solve problems

Jack BW, Chetty VK, Anthony D, et al. A reengineered hospital discharge program to decrease rehospitalization: a randomized clinical trial. *Ann Intern Med*. 2009;150(3):178–187.