

# Loneliness and ED Visits in Chronic Obstructive Pulmonary Disease

Paige K. Marty, MD; Paul Novotny, MS; and Roberto P. Benzo, MD

## Abstract

The primary objective of this study was to investigate the association of loneliness and the incidence of ED visits in a large and well-characterized cohort of patients with severe chronic obstructive pulmonary disease (COPD); the association of loneliness with performance measures and health perception was the secondary objective. Baseline data were used from the National Emphysema Treatment Trial (NETT), which investigated the effectiveness of lung volume reduction surgery in patients with moderate-to-severe COPD. Patients received Quality of Wellbeing questionnaires, which asked about loneliness and social isolation. For comparing baseline variables between lonely and non-lonely subjects, we used  $\chi^2$  tests for categorical variables and Wilcoxon tests for continuous variables. The association of loneliness with ED visits and health perception was assessed with a logistic model that adjusted for multiple critical confounders. The study took place from December 2002, to December 2004, with a follow-up period of 5 years to assess loneliness and 24 months to assess use of the emergency department. There were 1218 patients analyzed, mean age 65 (standard deviation [SD] 12), 47% were women, FEV<sub>1</sub> 1% 41 (SD 12); 7.9% of participants reported feeling lonely. These individuals had worse health ratings, 6-minute walk tests (6MWTs), and breathlessness. Loneliness was independently associated with ED visits after adjusting for age, lung function, dyspnea, 6MWT, treatment, and gender, odds ratio (OR) 1.57 (95% confidence interval [CI], 1.005-2.466),  $P=.04$ . This study suggests that loneliness in patients with COPD is significantly and independently associated to ED visits and reduced health perception. Addressing loneliness of patients with COPD in the outpatient setting may contribute to improved health perception and less health care utilization.

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From the Department of Internal Medicine (P.K.M.), the Department of Pulmonary and Critical Care Medicine, and the NETT Research Group (P.N., R.P.B.), Mayo Clinic, Rochester, MN.

Chronic obstructive pulmonary disease (COPD) is a common chronic condition, estimated to affect 11.7% of the population across the globe. This figure is expected to increase over the next 30 years with a subsequent rise in the number of deaths due to the condition. At present, it is the fourth most common cause of death in the United States.<sup>1</sup> Anxiety, depression, and loneliness are commonly recognized psychologic comorbidities of COPD.<sup>2-4</sup> Quality of life in patients with COPD is affected by these factors and comorbidities leading to an inability to engage in activities, decreased exercise capacity, and anxiety/depression.<sup>4,5</sup>

Loneliness, in particular, is a significant obstacle for individuals living with COPD,<sup>3,6</sup> as well as an overall public health concern. Loneliness can be defined as the feeling that one's social relations are inadequate, leading

to subjective dissatisfaction.<sup>7</sup> This subsequently may contribute to a sense of distress<sup>8</sup> and has been linked to adverse outcomes in mortality and mental health.<sup>7,9</sup> Overall, loneliness seems to be increasing in the United States<sup>8</sup> and prevails among older adults.<sup>10</sup> Those with limited mobility—which can be seen in the COPD population because of progressive lethargy and dyspnea—are at increased risk for loneliness.<sup>2,8</sup> Loneliness is associated with social-skill deficits<sup>7</sup> and worse outcomes in mental health issues such as depression and anxiety,<sup>7,11</sup> leading to worsening dyspnea.<sup>2</sup> In addition, patient lack of understanding about their own diagnoses of COPD can lead to social isolation<sup>12</sup> and increased mortality.<sup>13</sup>

Similarly, the concept of social isolation, both objective and subjective, is associated with an increased risk of mortality and higher

health care utilization.<sup>13,14</sup> It has been shown that persons who primarily use outpatient health care compared with inpatient health care feel less lonely and have a lower risk of depression.<sup>15</sup> Patients who experience chronic loneliness have higher numbers of physician visits, particularly the emergency department,<sup>7</sup> suggesting that there may be a cycle of illness and use of the health care system.<sup>14</sup> There is a knowledge gap on the association of loneliness and health care utilization in COPD. We aimed to investigate that knowledge gap in a large and well-characterized cohort of patients with severe COPD.

## METHODS

This study uses baseline data from the previously published National Emphysema Treatment Trial (NETT).<sup>16</sup> NETT design and methodology has been previously detailed. The NETT was conducted in accordance with the amended Declaration of Helsinki. Local institutional review boards approved the NETT protocol, and written informed consent was obtained from all patients. The study took place from December 2002, to December 2004.

In brief, NETT consented participants from 17 centers who were included in their trial if nonsmokers (abstinent  $\geq 6$  months) with moderate-to-severe COPD. The primary outcome of the study was to investigate the effectiveness of lung volume reduction surgery (LVRS).

Pertinent to this study, loneliness was measured by a psychometrically validated question from the Quality of Wellbeing questionnaire: Do you feel lonely or socially isolated (yes/no).<sup>16</sup> Patients were defined as not lonely if they responded “No days” to the question “Feelings of being lonely or isolated” at baseline. Patients were classified as lonely if they responded “Yesterday,” “2 days ago” or “3 days ago.” The patients were given the questionnaire at study enrollment. The follow-up period was 5 years to assess loneliness, and 24 months to assess use of the emergency department.

Health ratings were determined using the 36-Item Short Form Survey Instrument (SF-36) question 1.<sup>16</sup> The question reads: “In general, would you say your health is: 1-Excellent, 2-Very Good, 3-Good, 4-Fair, 5-Poor.”<sup>17</sup>

The Modified Medical Research Council Dyspnea Scale (mMRC) is a tool widely used and recommended by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines to stratify the severity of dyspnea in individuals with COPD. Using the mMRC scale, patients can quantify their shortness of breath on a scale ranging from 0 (dyspnea only with strenuous exercise) to 4 (too dyspneic to leave the house).

## Statistical Methods

Baseline variables between non-lonely and lonely subjects were performed by using Wilcoxon tests for continuous variables and  $\chi^2$  tests for categorical variables. The association between loneliness and having any ED visits was assessed using a logistic model that adjusted for NETT study arm, age, FEV<sub>1</sub>, mMRC. The latter 3 variables comprise the Age, Dyspnea, Airflow Obstruction (ADO) Index.<sup>18</sup> This is a tool that has been used to predict 2-year mortality in patients with COPD. We defined these variables *a priori* to be included in the models, as they are considered as critical outcomes in COPD. We included the treatment arm as the whole cohort of the NETT study and also included gender to be investigated as a biological variable. All analyses were done using SAS version 9.4 (SAS Institute Inc., Cary, NC).

## RESULTS

The follow-up period was 5 years to assess loneliness and 24 months to determine use of the emergency department. Patient characteristics are included in Table 1. In summary, 96 of 1217 subjects (7.9%) were classified as lonely. Lonely patients were more likely to be women; 11% of women were lonely compared with 6% of men. In addition, lonely people had decreased 6-minute walk test (6MWT) distances, lower overall health ratings, and increased breathlessness (Table 1). Loneliness was significantly associated with increased use of the health care system, as represented by lonely patients being significantly more likely to visit the emergency department in the 5 years of follow-up of the study (Table 2) after adjusting for age, lung function, gender, dyspnea, 6MWT, and treatment arm. Lonely patients had ORs of 1.57 (95% confidence interval [CI] of 1.005 to 2.466,  $P=.04$ ) for having an

TABLE 1. Characteristics of All 1217 Patients at Baseline\*

Characteristics	Not Lonely (N=1121)	Lonely (N=96)	P value
Treatment arm (LVRS or not)	50.2%	49.0%	.81
Sex, male	62.7%	44.8%	.0005
Age, mean (SD), years	66.5 (6.0)	64.9 (6.9)	.06
Post-BD FEV 1% pred, mean (SD)	26.7 (7.3)	26.9 (6.6)	.74
6-minute walk distance in feet, mean (SD)	1214.5 (310.6)	1141.6 (337.4)	.01
Total days in hospital, mean (SD)	3.0 (7.5)	4.9 (10.1)	.45
Any days in hospital, yes	32.7%	33.7%	.85
Total visits to ED, mean (SD)	0.7 (1.2)	0.9 (1.4)	.02
Any visit to ED, yes	37.6%	50.0%	.02
Health, in General: weighted, mean (SD)	2.8 (1.1)	2.3 (1.1)	<.0001
MRC dyspnea scale			.01
0	1.6%	0.0%	
1	0.4%	0.0%	
2	26.5%	15.6%	
3	22.0%	16.7%	
4	49.5%	67.7%	

\*Baseline measurements were obtained after rehabilitation but before randomization.

LVRS = lung volume reduction surgery; MRC scale = Medical Research Council dyspnea scale; N = sample; Post-BD FEV1% pred = postbronchodilator forced expiratory volume in 1 second % predicted; SD = standard deviation.

ED visit compared with patients who were not lonely. Loneliness was assessed yearly and was found to increase continuously over time, beginning with 8% at baseline and increasing to 14% by year 5. Marital status was included as an exploratory variable in the model for having any ED visits. When this model was performed, loneliness showed a trend toward significance, suggesting marital status and loneliness are strongly related ( $P=0.08$ ). Similarly, 5% of married patients were lonely compared with 13% of other patients. Finally, we explored the association of loneliness in relation to patient perception of overall health. Loneliness was found to be significantly related to lower overall perception of general health ( $P=<0.0001$ ) after adjusting for age, lung function, treatment arm, marital status, and breathlessness score, with lonely patients having health ratings 9.9 points lower than other patients (Table 3).

## DISCUSSION

This study examined the relationship between loneliness and ED visits as a measure of health care utilization and the perception of general health in moderate-to-severe COPD. Our results suggest that loneliness is independently associated with more ED visits and worse

perception of health. We confirm and extend the findings of other studies demonstrating worse outcomes for lonely people and those with other chronic conditions.<sup>19,20</sup> However, this report includes a very well-characterized population of patients with COPD. Theeke et al demonstrated that patients with lung disease had higher levels of loneliness and that this loneliness also correlated with total number of chronic conditions.<sup>19</sup> We showed that lonely patients had increased dyspnea, and this has been shown to lead to decreased time spent outside the home because of breathlessness,<sup>5</sup> which may, in turn, create a cycle of worsening loneliness. Assisting this population in engagement in activities may be important in affecting overall well being.<sup>5</sup> For example, Theeke et al showed that quality of life may be enhanced in survivors of stroke following interventions targeting loneliness, suggesting that assessment of loneliness be incorporated into routine clinical practice. We enthusiastically agree with other reports that recommend possible initiation of cognitive behavioral interventions or health coaching to target loneliness.<sup>20,21</sup> In addition, loneliness has been shown as an independent risk factor for physical inactivity,<sup>22</sup> and increased physical activity has been associated with healthy aging.<sup>23</sup> In a study by Kara et al,

it was demonstrated that, as patients with COPD experience disease progression, their quality of life is affected, as increased breathlessness results in social isolation.<sup>3</sup> Finally, it has been found that social isolation is linked to mortality.<sup>24</sup> Our findings on the association loneliness with health status perception extend previous report regarding social isolation and a higher disease burden.<sup>6,25</sup>

The uniqueness of this report is that we found that loneliness is independently associated with increased ED visits and health perception after adjusting for the most meaningful confounders in COPD in a very large and well-characterized population with a meaningful follow-up period. Our results also agree with previous reports. A study by Geller et al showed that loneliness predicted use of the emergency department as demonstrated by those with above-average loneliness scores made use of the hospital's emergency department 60% more per year than those who scored less than the mean.<sup>26</sup> Molloy et al has also illustrated that in adults older than age 65, increased loneliness was associated with hospitalization.<sup>27</sup> Our study further confirms that lonely patients make more use of the emergency department but in a much larger and well-characterized cohort of patients with severe COPD.<sup>26,28</sup> It is possible that a higher degree of neediness and lack of support for health-related decision making is associated with uncertainty, stress, and higher likelihood of visiting emergency departments. Of note, loneliness was almost as significant when adjusted to marital status, suggesting that even married persons may experience feelings of isolation.

### STRENGTHS AND LIMITATIONS

This is the largest report that shows an association between loneliness and health care utilization adjusted for most meaningful factors in COPD. We acknowledge that loneliness was not measured by a specific loneliness tool. However, the question used has been tested and is part of a highly validated tool (Quality of Wellbeing questionnaire) in the COPD population.<sup>29</sup> Although question number 1 of the SF-36, determining patients' perceptions of general health, has been widely used, it has not been specifically validated in COPD. Despite this, the brevity of these assessments

**TABLE 2. Loneliness as a Determinant of Any ED Visits, Adjusted for Age, Sex, Post-FEV 1% predicted, and MRC**

Logistic Regression Estimates		
Variable	Odds Ratio (95% CI)	P value
Feeling lonely or isolated	1.57 (1.01,2.47)	<b>.04</b>
Medical treatment	0.82 (0.64,1.05)	.11
Sex, male	1.04 (0.79,1.36)	.80
Age	0.97 (0.95,0.99)	.01
Post-BD FEV 1% pred	1.01 (0.99,1.03)	.23
6-minute walk distance in feet	1.00 (1.00,1.00)	.99
MRC dyspnea scale	1.01 (0.88,1.16)	.90

CI = confidence interval; DF = degrees of freedom; Post-BD FEV1% pred = postbronchodilator forced expiratory volume in 1 second; MRC scale = Medical Research Council dyspnea scale.

allows for use in routine, busy clinical practice in both the inpatient and outpatient settings.

### CONCLUSION

Loneliness is an important public health issue, particularly in those with chronic illness such as COPD. This study shows that increased loneliness is significantly associated with a high incidence of visits to emergency departments and poorer perception of health in patients with moderate-to-severe COPD. In addition, our study demonstrates that loneliness is related to worse perception of general health from the patient perspective, and it is possible that even married patients experience feelings of social isolation. It is plausible that addressing loneliness in the outpatient setting may ultimately contribute to decreased ED visits and improved quality of life for this population by improving perceptions of health.

**TABLE 3. Loneliness as a Determinant of Perception of General Health**

Logistic Regression Estimates		
Variable	Parameter Estimate (standard error)	P value
Feeling lonely or isolated	-9.92 (2.14)	<b>&lt;.0001</b>
Medical treatment	-0.03 (1.14)	.98
Sex, male	-0.99 (1.23)	.42
Age	0.71 (0.10)	<.0001
Post BD FEV 1% pred	0.12 (0.09)	.17
mMRC dyspnea scale	-4.05 (0.63)	<.0001

mMRC scale = modified Medical Research Council dyspnea scale; Post-BD FEV 1% pred = postbronchodilator forced expiratory volume in 1 second.

The methods of assessment of loneliness in this study are brief, which can allow for them to be employed effectively by clinicians. Our report suggests the need of frequent assessment of loneliness in routine practice.

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The complete list of the NETT Research Group members. Members of the NETT Research follows:

### Office of the Chair of the Steering Committee

*University of Pennsylvania, Philadelphia, PA:* Alfred P. Fishman, MD (Chair); Betsy Ann Bozzarello; Ameena Al-Amin.

### Clinical Centers

*Baylor College of Medicine, Houston, TX:* Marcia Katz, MD (Principal Investigator); Carolyn Wheeler, RN, BSN (Principal Clinic Coordinator); Elaine Baker, RRT, RPFT; Peter Barnard, PhD, RPFT; Phil Cagle, MD; James Carter, MD; Sophia Chatziioannou, MD; Karla Conejo-Gonzales; Kimberly Dubose, RRT; John Haddad, MD; David Hicks, RRT, RPFT; Neal Kleiman, MD; Mary Milburn-Barnes, CRTT; Chinh Nguyen, RPFT; Michael Reardon, MD; Joseph Reeves-Viets, MD; Steven Sax, MD; Amir Sharafkhaneh, MD; Owen Wilson, PhD; Christine Young, PT; Rafael Espada, MD (Principal Investigator 1996-2002); Rose Butanda (1999-2001); Minnie Ellisor (2002); Pamela Fox, MD (1999-2001); Katherine Hale, MD (1998-2000); Everett Hood, RPFT (1998-2000); Amy Jahn (1998-2000); Satish Jhingran, MD (1998-2001); Karen King, RPFT (1998-1999); Charles Miller III, PhD (1996-1999); Imran Nizami, MD (Co-Principal Investigator, 2000-2001); Todd Officer (1998-2000); Jeannie Ricketts (1998-2000); Joe Rodarte, MD (Co-Principal Investigator 1996-2000); Robert Teague, MD (Co-Principal Investigator 1999-2000); Kedren Williams (1998-1999).

*Brigham and Women's Hospital, Boston, MA:* John Reilly, MD (Principal Investigator); David Sugarbaker, MD (Co-Principal Investigator); Carol Fanning, RRT (Principal Clinic Coordinator); Simon Body, MD; Sabine Duffy, MD; Vladmir Formanek, MD; Anne Fuhlbrigge, MD; Philip Hartigan, MD; Sarah Hooper, EP; Andetta Hunsaker, MD; Francine Jacobson, MD; Marilyn Moy, MD; Susan Peterson,

RRT; Roger Russell, MD; Diane Saunders; Scott Swanson, MD (Co-Principal Investigator, 1996-2001).

*Cedars-Sinai Medical Center, Los Angeles, CA:* Rob McKenna, MD (Principal Investigator); Zab Mohsenifar, MD (Co-Principal Investigator); Carol Geaga, RN (Principal Clinic Coordinator); Manmohan Biring, MD; Susan Clark, RN, MN; Jennifer Cutler, MD; Robert Frantz, MD; Peter Julien, MD; Michael Lewis, MD; Jennifer Minkoff-Rau, MSW; Valentina Yegyan, BS, CPFT; Milton Joyner, BA (1996-2002).

*Cleveland Clinic Foundation, Cleveland, OH:* Malcolm DeCamp, MD (Principal Investigator); James Stoller, MD (Co-Principal Investigator); Yvonne Meli, RN, (Principal Clinic Coordinator); John Apostolakis, MD; Darryl Atwell, MD; Jeffrey Chapman, MD; Pierre DeVilliers, MD; Raed Dweik, MD; Erik Kraenzler, MD; Rosemary Lann, LISW; Nancy Kurokawa, RRT, CPFT; Scott Marlow, RRT; Kevin McCarthy, RCPT; Priscilla McCreight, RRT, CPFT; Atul Mehta, MD; Moulay Meziane, MD; Omar Minai, MD; Mindi Steiger, RRT; Kenneth White, RPFT; Janet Maurer, MD (Principal Investigator, 1996-2001); Terri Durr, RN (2000-2001); Charles Hearn, DO (1998-2001); Susan Lubell, PA-C (1999-2000); Peter O'Donovan, MD (1998-2003); Robert Schilz, DO (1998-2002).

*Columbia University, New York, NY in consortium with Long Island Jewish Medical Center, New Hyde Park, NY:* Mark Ginsburg, MD (Principal Investigator); Byron Thomashow, MD (Co-Principal Investigator); Patricia Jellen, MSN, RN (Principal Clinic Coordinator); John Austin, MD; Matthew Bartels, MD; Yahya Berkmen, MD; Patricia Berkoski, MS, RRT (Site coordinator, LIJ); Frances Brogan, MSN, RN; Amy Chong, BS, CRT; Glenda DeMercado, BSN; Angela DiMango, MD; Sandy Do, MS, PT; Bessie Kachulis, MD; Arfa Khan, MD; Berend Mets, MD; Mitchell O'Shea, BS, RT, CPFT; Gregory Pearson, MD; Leonard Rossoff, MD; Steven Scharf, MD, PhD (Co-Principal Investigator, 1998-2002); Maria Shiau, MD; Paul Simonelli, MD; Kim Stavrolakes, MS, PT; Donna Tsang, BS; Denise Vilotijevic, MS, PT; Chun Yip, MD; Mike Mantinaos, MD (1998-2001); Kerri McKeon, BS, RRT, RN (1998-1999); Jacqueline Pfeffer, MPH, PT (1997-2002).



*Duke University Medical Center, Durham, NC:* Neil MacIntyre, MD (Principal Investigator); R Duane Davis, MD (Co-Principal Investigator); John Howe, RN (Principal Clinic Coordinator); R. Edward Coleman, MD; Rebecca Crouch, RPT; Dora Greene; Katherine Grichnik, MD; David Harpole Jr, MD; Abby Krichman, RRT; Brian Lawlor, RRT; Holman McAdams, MD; John Plankeel, MD; Susan Rinaldo-Gallo, MED; Sheila Shearer, RRT; Jeanne Smith, ACSW; Mark Stafford-Smith, MD; Victor Tapson, MD; Mark Steele, MD (1998-1999); Jennifer Norten, MD (1998-1999).

*Mayo Foundation, Rochester, MN:* James Utz, MD (Principal Investigator); Claude Deschamps, MD (Co-Principal Investigator); Kathy Mieras, CCRP. (Principal Clinic Coordinator); Martin Abel, MD; Mark Allen, MD; Deb Andrist, RN; Gregory Aughenbaugh, MD; Sharon Bendel, RN; Eric Edell, MD; Marlene Edgar; Bonnie Edwards; Beth Elliot, MD; James Garrett, RRT; Delmar Gillespie, MD; Judd Gurney, MD; Boleyn Hammel; Karen Hanson, RRT; Lori Hanson, RRT; Gordon Harms, MD; June Hart; Thomas Hartman, MD; Robert Hyatt, MD; Eric Jensen, MD; Nicole Jenson, RRT; Sanjay Kalra, MD; Philip Karsell, MD; Jennifer Lamb; David Midthun, MD; Carl Mottram, RRT; Stephen Swensen, MD; Anne-Marie Sykes, MD; Karen Taylor; Norman Torres, MD; Rolf Hubmayr, MD (1998-2000); Daniel Miller, MD (1999-2002); Sara Bartling, RN (1998-2000); Kris Bradt (1998-2002).

*National Jewish Medical and Research Center, Denver, CO:* Barry Make, MD (Principal Investigator); Marvin Pomerantz, MD (Co-Principal Investigator); Mary Gilmartin, RN, RRT (Principal Clinic Coordinator); Joyce Canterbury; Martin Carlos; Phyllis Dibbern, PT; Enrique Fernandez, MD; Lisa Geyman, MSPT; Connie Hudson; David Lynch, MD; John Newell, MD; Robert Quaipe, MD; Jennifer Propst, RN; Cynthia Raymond, MS; Jane Whalen-Price, PT; Kathy Winner, OTR; Martin Zamora, MD; Reuben Cherniack, MD (Principal Investigator, 1997-2000). *Ohio State University, Columbus, OH:* Philip Diaz, MD (Principal Investigator); Patrick Ross, MD (Co-Principal Investigator); Tina Bees (Principal Clinic Coordinator); Jan Drake; Charles Emery, PhD; Mark Gerhardt, MD, PhD;

Mark King, MD; David Rittinger; Mahasti Rittinger. *Saint Louis University, Saint Louis, MO:* Keith Naunheim, MD (Principal Investigator); Robert Gerber, MD (Co-Principal Investigator); Joan Osterloh, RN, MSN (Principal Clinic Coordinator); Susan Borosh; Willard Chamberlain, DO; Sally Frese; Alan Hibbit; Mary Ellen Kleinhenz, MD; Gregg Ruppel; Cary Stolar, MD; Janice Willey; Francisco Alvarez, MD (Co-Principal Investigator, 1999-2002); Cesar Keller, M.D. (Co-Principal Investigator, 1996-2000). *Temple University, Philadelphia, PA:* Gerard Criner, MD (Principal Investigator); Satoshi Furukawa, MD (Co-Principal Investigator); Anne Marie Kuzma, RN, MSN (Principal Clinic Coordinator); Roger Barnette, MD; Neil Brister, MD; Kevin Carney, RN, CCTC; Wissam Chatila, MD; Francis Cordova, MD; Gilbert D'Alonzo, DO; Michael Keresztury, MD; Karen Kirsch; Chul Kwak, MD; Kathy Lautensack, RN, BSN; Madelina Lorenzon, CPFT; Ubaldo Martin, MD; Peter Rising, MS; Scott Schartel, MD; John Travaline, MD; Gwendolyn Vance, RN, CCTC; Phillip Boiselle, MD (1997-2000); Gerald O'Brien, MD (1997-2000).

*University of California, San Diego, San Diego, CA:* Andrew Ries, MD, MPH (Principal Investigator); Robert Kaplan, PhD (Co-Principal Investigator); Catherine Ramirez, BS, RCP (Principal Clinic Coordinator); David Frankville, MD; Paul Friedman, MD; James Harrell, MD; Jeffery Johnson; David Kapelanski, MD; David Kupferberg, MD, MPH; Catherine Larsen, MPH; Trina Limberg, RRT; Michael Magliocca, RN, CNP; Frank J. Papatheofanis, MD, PhD; Dawn Sassi-Dambron, RN; Melissa Weeks.

*University of Maryland at Baltimore, Baltimore, MD, in consortium with Johns Hopkins Hospital, Baltimore, MD:* Mark Krasna, MD (Principal Investigator); Henry Fessler, MD (Co-Principal Investigator); Iris Moskowitz (Principal Clinic Coordinator); Timothy Gilbert, MD; Jonathan Orens, MD; Steven Scharf, MD, PhD; David Shade; Stanley Siegelman, MD; Kenneth Silver, MD; Clarence Weir; Charles White, MD.

*University of Michigan, Ann Arbor, MI:* Fernando Martinez, MD (Principal Investigator); Mark Iannettoni, MD (Co-Principal Investigator); Catherine Meldrum, BSN, RN, CCRN (Principal Clinic Coordinator); William Bria,

MD; Kelly Campbell; Paul Christensen, MD; Kevin Flaherty, MD; Steven Gay, MD; Paramjit Gill, RN; Paul Kazanjian, MD; Ella Kazerooni, MD; Vivian Knieper; Tammy Ojo, MD; Lewis Poole; Leslie Quint, MD; Paul Rysso; Thomas Sisson, MD; Mercedes True; Brian Woodcock, MD; Lori Zaremba, RN.

*University of Pennsylvania, Philadelphia, PA:* Larry Kaiser, MD (Principal Investigator); John Hansen-Flaschen, MD (Co-Principal Investigator); Mary Louise Dempsey, BSN, RN (Principal Clinic Coordinator); Abass Alavi, MD; Theresa Alcorn, Selim Arcasoy, MD; Judith Aronchick, MD; Stanley Aukberg, MD; Bryan Benedict, RRT.; Susan Craemer, BS, RRT, CPFT; Ron Daniele, MD; Jeffrey Edelman, MD; Warren Gefter, MD; Laura Kotler-Klein, MSS; Robert Kotloff, MD; David Lipson, MD; Wallace Miller Jr, MD; Richard O'Connell, RPFT; Staci Oelman, MSW; Harold Palevsky, MD; William Russell, RPFT; Heather Sheaffer, MSW; Rodney Simcox, BSRT, RRT; Susanne Snedeker, RRT, CPFT; Jennifer Stone-Wynne, MSW; Gregory Tino, MD; Peter Wahl; James Walter, RPFT; Patricia Ward; David Zisman, MD; James Mendez, MSN, CRNP (1997-2001); Angela Wurster, MSN, CRNP (1997-1999).

*University of Pittsburgh, Pittsburgh, PA:* Frank Sciarba, MD (Principal Investigator); James Luketich, MD (Co-Principal Investigator); Colleen Witt, MS (Principal Clinic Coordinator); Gerald Ayres; Michael Donahoe, MD; Carl Fuhrman, MD; Robert Hoffman, MD; Joan Lacomis, MD; Joan Sexton; William Slivka; Diane Strollo, MD; Erin Sullivan, MD; Tomeka Simon; Catherine Wrona, RN, BSN; Gerene Bauldoff, RN, MSN (1997-2000); Manuel Brown, MD (1997-2002); Elisabeth George, RN, MSN (Principal Clinic Coordinator 1997-2001); Robert Keenan, MD (Co-Principal Investigator 1997-2000); Theodore Kopp, MS (1997-1999); Laurie Silfies (1997-2001).

*University of Washington, Seattle, WA:* Joshua Benditt, MD (Principal Investigator); Douglas Wood, MD (Co-Principal Investigator); Margaret Snyder, MN (Principal Clinic Coordinator); Kymberley Anable; Nancy Battaglia; Louie Boitano; Andrew Bowdle, MD; Leighton Chan, MD; Cindy Chwalik; Bruce Culver, MD; Thurman Gillespy, MD; David Godwin, MD; Jeanne Hoffman; Andra Ibrahim, MD; Diane Lockhart; Stephen Marglin, MD; Kenneth Martay, MD; Patricia McDowell;

Donald Oxorn, MD; Liz Roessler; Michelle Toshima; Susan Golden (1998-2000).

#### **Other Participants**

*Agency for Healthcare Research and Quality, Rockville, MD:* Lynn Bosco, MD, MPH; Yen-Pin Chiang, PhD; Carolyn Clancy, MD; Harry Handelsman, DO.

*Centers for Medicare and Medicaid Services, Baltimore, MD:* Steven M Berkowitz, PhD; Tanisha Carino, PhD; Joe Chin, MD; JoAnna Baldwin; Karen McVearry; Anthony Norris; Sarah Shirey; Claudette Sikora; Steven Sheingold, PhD (1997-2004).

*Coordinating Center, The Johns Hopkins University, Baltimore, MD:* Steven Piantadosi, MD, PhD (Principal Investigator); James Tonascia, PhD (Co-Principal Investigator); Patricia Belt; Amanda Blackford, ScM; Karen Collins; Betty Collison; Ryan Colvin, MPH; John Dodge; Michele Donithan, MHS; Vera Edmonds; Gregory L. Foster, MA; Julie Fuller; Judith Harle; Rosetta Jackson; Shing Lee, ScM; Charlene Levine; Hope Livingston; Jill Meinert; Jennifer Meyers; Deborah Nowakowski; Kapreena Owens; Shangqian Qi, MD; Michael Smith; Brett Simon, MD; Paul Smith; Alice Sternberg, ScM; Mark Van Natta, MHS; Laura Wilson, ScM; Robert Wise, MD.

*Cost-Effectiveness Subcommittee:* Robert M. Kaplan, PhD (Chair); J. Sanford Schwartz, MD (Co-Chair); Yen-Pin Chiang, PhD; Marianne C. Fahs, PhD; A. Mark Fendrick, MD; Alan J. Moskowitz, MD; Dev Pathak, PhD; Scott Ramsey, MD, PhD; Steven Sheingold, PhD; A. Laurie Shroyer, PhD; Judith Wagner, PhD; Roger Yusen, MD.

*Cost-Effectiveness Data Center, Fred Hutchinson Cancer Research Center, Seattle, WA:* Scott Ramsey, MD, PhD (Principal Investigator); Ruth Etzioni, PhD; Sean Sullivan, PhD; Douglas Wood, MD; Thomas Schroeder, MA; Karma Kreizenbeck; Kristin Berry, MS; Nadia Howlader, MS.

*CT Scan Image Storage and Analysis Center, University of Iowa, Iowa City, IA:* Eric Hoffman, PhD (Principal Investigator); Janice Cook-Granroth, BS; Angela Delsing, RT; Junfeng Guo, PhD; Geoffrey McLennan, MD; Brian Mullan, MD; Chris Piker, BS; Joseph Reinhardt, PhD; Blake Wood; Jered Sieren, RTR; William Stanford, MD.

*Data and Safety Monitoring Board:* John A. Waldhausen, MD (Chair); Gordon Bernard,

MD; David DeMets, PhD; Mark Ferguson, MD; Eddie Hoover, MD; Robert Levine, MD; Donald Mahler, MD; A. John McSweeney, PhD; Jeanine Wiener-Kronish, MD; O. Dale Williams, PhD; Magdy Younes, MD.

Marketing Center, Temple University, Philadelphia, PA: Gerard Criner, MD (Principal Investigator); Charles Soltoff, MBA.

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**Abbreviations and Acronyms:** COPD = chronic obstructive pulmonary disease; FEV1 = forced expiratory volume in 1 second; LVRS = lung volume reduction surgery; mMRC = modified medical research council; NETT = National Emphysema Treatment Trial; SF-36 = 36-Item Short Form Survey Instrument; 6MWT = 6-minute walk test

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**Correspondence:** Address to Roberto P. Benzo, MD, Department of Pulmonary Medicine, Mayo Clinic, 200 First St. SW, Rochester, MN 55905 (Benzo.Roberto@mayo.edu).

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