

Division of Pulmonary, Critical Care, and Sleep Medicine



J. Woodrow Weiss, MD,
Chief

● *Overview*

The Division of Pulmonary, Critical Care, and Sleep Medicine performs a broad array of clinical activities, teaches medical students, residents, and fellows both at Beth Israel Deaconess Medical Center and at Harvard Medical School, and conducts a substantial portfolio of clinical and basic research. The 20 physician faculty members and two PhD scientists in the Division occupy leadership positions at Beth Israel Deaconess Medical Center, at Harvard Medical School, and in the Harvard Combined Fellowship in Pulmonary and Critical Care Medicine, while simultaneously serving nationally in specialty societies of pulmonary, critical care, and sleep medicine.

The Division leadership includes J. Woodrow Weiss, Division Chief; and Richard Schwartzstein, Associate Chief, and Vice President for Education at Beth Israel Deaconess Medical Center. Clinical pulmonary activities are directed by David Roberts, Clinical Director of the Division; Peter LaCamera, Director of the Pulmonary Consultation Service; Peter Clardy, Director of the Medical Intensive Care Service with Michael Howell, Associate Director; and Geoffrey Gilmartin, Coordinator of the program in sleep medicine and the sleep laboratory. Armin Ernst is the Director of the nationally renowned program in Interventional Pulmonology.

The Division is a core member of the Harvard Combined Fellowship in Pulmonary and Critical Care Medicine for which the Division provides important rotations in consultative pulmonary medicine as well as medical critical care. Pulmonary and critical care fellows rotate, as well, through the longitudinal pulmonary clinic. Fellowship training in Pulmonary and Critical Care Medicine is coordinated by Patricia Kritek, Associate Director of the Harvard Combined

Fellowship in Pulmonary and Critical Care. Robert Thomas directs one of the first and largest ACGME accredited multi-disciplinary fellowships in Sleep Medicine. Armin Ernst coordinates the highly sought after fellowship program in Interventional Pulmonology. These fellowships reflect the remarkable educational success of the Division in the last five years. The Combined Harvard Fellowship is among the most sought after and largest training programs in pulmonary and critical care in the United States. The fellowship in sleep medicine is among the most prestigious training programs in the United States, and the Interventional fellowship is the most selective in the country with intense competition for the few training positions.

● *Clinical Activities*

The Division oversees the Medical Intensive Care Service at Beth Israel Deaconess, directing care to critically ill medical patients throughout the institution and supplying clinical and administrative leadership in critical care. Twenty-eight medical ICU beds in three intensive care units constitute the largest medical ICU service in the region and support referrals from all of New England. Under the leadership of Peter Clardy, Director of the Medical Intensive Care Service and Michael Howell, Associate Director, the Medical ICU (MICU) service has implemented a range of quality initiatives that have been emulated by other local academic medical centers in the region. Dr. Howell serves simultaneously as the medical center's Director of Critical Care Quality, and in this capacity coordinates a range of novel quality improvement activities in the medical ICUs and in other ICUs in the medical center. Working with a multi-disciplinary team of clinicians and informatics specialists, the MICU service has recently implemented a state-of-the-art com-

puter system to support these quality initiatives and to streamline clinical practice, placing the service in the forefront of national programs.



• Drs. Geoff Gilmartin and Catherine McKinnon.

Outpatient consultations in pulmonary and sleep medicine are provided in the Shapiro Clinical Center and at the Lexington Center. Specialty pulmonary programs have been developed in interstitial lung disease, pulmonary hypertension, and dyspnea (one of only two such programs in the country). In addition, the Division participates in the Multi-disciplinary Program in Thoracic Oncology. The Center for Interstitial Pulmonary Fibrosis is representative of these specialty programs. The IPF Center brings together basic and clinical scientists with an interdisciplinary group of radiologists, surgeons, and pathologists to provide sophisticated diagnostic evaluations. The Center

also has among the most active profiles in New England conducting clinical trials of novel therapies. The Sleep Disorders Center is nationally known for its innovative therapeutic and diagnostic approaches to patients with sleep-disordered breathing. Six senior clinicians, all with specialty training in sleep medicine, as well as pulmonary and critical care, staff the Center, which is among the busiest sleep programs in the Northeast.

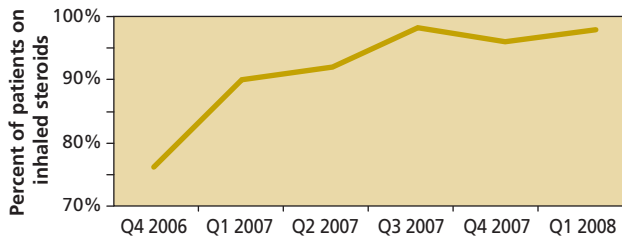
The Division provides unique services through the Interventional Pulmonary-Complex Airway Disease Center. Conducted in collaboration with Thoracic Surgery, this program represents the most active Interventional Pulmonology service in the U.S. Working in the recently renovated Center for Chest Diseases, the IP

program provides a broad range of minimally invasive procedures to patients referred from across the U.S. This program, directed by Armin Ernst with the assistance of Adnan Majid and Gaetane Michaud has introduced novel technologies (such as the use of bronchial ultrasound to enhance the yield of trans-bronchial needle aspirations) and, with involvement of the outstanding Chest Radiology section of the Department of Radiology, has pioneered the use of non-invasive techniques such as CT virtual bronchoscopy to improve the care of patients with complex airway problems.

● *Quality Improvement*

The Division continues in a leadership role within the institution regarding quality improvement with Michael Howell serving as the medical center's Director for Critical Care Quality. Active quality improvement efforts are ongoing in critical care (Peter Clardy, Michael Howell), in ambulatory and in-patient pulmonary medicine (David Roberts), in sleep medicine (Geoffrey Gilmartin) and in interventional pulmonology (Armin Ernst). The list of accomplishments is too long to detail but a few examples include:

- Substantial progress has been made toward ensuring that patients with a diagnosis of asthma are treated with inhaled corticosteroids according to current guidelines.
- We have implemented a unique intervention pathway to reduce the risk of adverse events in patients with suspected sleep apnea who are undergoing anesthesia and surgery.
- We have dramatically reduced the rates of both hospital-acquired central venous catheter infections and ventilator associated pneumonias. The reduction in ventilator pneumonias has occurred in large part due to nearly 100% compliance with all aspects of the ventilator bundle of practices recommended by the Institute for Healthcare Improvement, which are designed to reduce hospital acquired infections.



- Patients with a diagnosis of asthma treated with inhaled corticosteroids according to current guidelines.

● *Educational Programs*

The Pulmonary, Critical Care, and Sleep Medicine Division participates in an integrated pulmonary training program that includes Beth Israel Deaconess Medical Center, Massachusetts General Hospital, and Brigham & Women's Hospital. With nine fellows chosen annually, this is the largest pulmonary training program in the U.S. At Beth Israel Deaconess, fellows rotate through the medical intensive care unit, as well as serve on the pulmonary consult service, and in the pulmonary function laboratory. In addition, the Division recently established one of the first sleep medicine fellowships accredited by the Accreditation Council for Graduate Medical Education. With four fellows in clinical training each year, this is among the largest sleep training programs in the U.S. Finally, Dr. Ernst has established one of the most highly sought after training programs in interventional pulmonology in the country at Beth Israel Deaconess.

In addition to the pulmonary and critical care and sleep fellowships, members of the Division play active roles in post-graduate and medical student teaching. Richard Schwartzstein serves as Vice President for Education at the medical center and oversees medical student and resident educational programs at the institution. Dr. Schwartzstein also serves a major teaching role in the medical school as overall coordinator of the Human Systems block, a major component of the 1st year experience for medical students. David Roberts has recently assumed the title of Assistant Director of the Shapiro Institute and is Director, Undergraduate Education within the Institute. Dr. Roberts is also co-director of the of pulmonary pathophysiology block taught to 2nd-year Harvard medical students. Other courses run by Division faculty include: clinical clerkships in the medical intensive care unit coordinated by Dr. Clardy; an integrated Harvard-wide clerkship in pulmonary medicine coordinated by Dr. Silvestri; an elective in consultative pulmonary medicine coordinated by Dr. Silvestri; and, an elective in sleep disorders medicine coordinated by Drs. Thomas and Pogach.

The success of the Division's teaching efforts is attested to by the numerous teaching awards won by faculty. These awards are voted on annually by medical students, residents and pulmonary fellows and the Division's harvest each year is impressive testimony to the efforts made by Division faculty.

● *Research Activities*

The Division of Pulmonary, Critical Care and Sleep Medicine conducts basic, translational, and clinical research programs supported by grants from the National Institutes of Health, foundations, and industry. Basic researchers include Norma Gerard, who has active collaborations with investigators at Children's Hospital, focusing on the molecular mechanisms of leukocyte trafficking. Her group is particularly interested in the family of G protein-coupled receptors that direct the migration of

The Division of Pulmonary, Critical Care, and Sleep Medicine is active in clinical, educational and research activities

Clinical Services:

- Medical ICU
- Hospital Consultation
- Ambulatory Pulmonary
- Pulmonary Rehabilitation
- Interventional Pulmonology
- Sleep Medicine

Educational Activities:

- Combined Harvard Fellowship in Pulmonary & Critical Care
- Sleep Medicine Fellowship
- Interventional Pulmonology Fellowship
- CME Programs

Research Programs:

- Macrophage cell/molecular biology in host defenses
- Hypoxic chemosensitivity
- Sympathetic response to intermittent hypoxia
- ICU practice
- Pulmonary Fibrosis drug treatment trials
- Vascular mediators of ARDS
- Neutrophil function in airway inflammation



• Drs. Richard Schwartzstein and Rachel Frederick.

Research Funding • AY'07

Federal Direct	1,822,803
Federal Indirect	1,074,726
Other Direct	653,935
Other Indirect	93,354

leukocytes – both at baseline and during inflammation. This research has substantial implications for understanding airway inflammation in patients with asthma. Henry Koziel, with Naimish Patel, seeks to define the interaction of phagocytic receptors and Toll-like receptors to activate cellular host defense responses to infections challenge, using pathogens such as *Pneumocystis* and *Mycobacterium tuberculosis*. Collaborating with Laura Benjamin, Dianna Gallagher has begun to explore endothelial injury in Adult Respiratory Distress Syndrome, focusing on the role of angiopoetins.

Robert Thomas and Woodrow Weiss lead active laboratories investigating the consequences of sleep apnea. Dr. Thomas, working with collaborators in the Functional Magnetic Resonance Group at Massachusetts General Hospital, is characterizing the neuroanatomy and functional correlates of sleepiness. In other work with Ary Goldberger and Peter Kang of Cardiology, he is working to understand the causes of respiratory instability in sleep and has developed novel methodologies to stabilize breathing. Working with Drs. Yuzhen Liu and Ensheng Ji, Dr. Weiss is exploring carotid chemoreceptor and central nervous system control of sympathetic activity after exposure to intermittent hypoxia. Geoffrey Gilmartin and Melanie Pogach have extended this work to humans, using a novel model of cyclic hypoxic exposure to separate the effects of hypoxia from those of sleep disruption.

A number of clinical research projects are conducted by the Division. Armin Ernst has performed a series of investigations to better define the role of bronchoscopy and thoracoscopy in the management of complex airway and pleural disease. Joe Zibrak and

Peter LaCamera are active participants in clinical trials for interstitial lung disease, working with investigators from around the country. Additional investigations are conducted by David Roberts in pulmonary hypertension. With support from industry, Armin Ernst has recently developed a unique animal laboratory to examine the utility of a variety of novel bronchoscopic interventions for lung cancer.

Michael Howell has recently established a unique program to examine quality practices in critical care. With grant support from foundations, he is examining the use of medical emergency response teams to reduce ICU admissions and the use of protocols to improve the care of septic patients before and after ICU admission.

● *Awards and Honors*

Division members have been recognized locally and nationally for their accomplishments. Some examples serve to underscore the many individual accomplishments of the staff. Michael Howell was recognized by the Beth Israel Deaconess Medical Center Board of Directors with the Robert M. Meltzer Award given annually for “leading constructive, lasting, and all-embracing change.” Armin Ernst received the Pasquale Ciaglia Medal and gave the Honor Lecture for Achievements in Interventional Pulmonology at the Annual Meeting of the American College of Chest Physicians. Henry Koziel was voted to the Program Committee of the Annual Meeting of the American Thoracic Society. Peter Clardy received the Hermann L. Blumgart Faculty Award for the faculty member who contributed most to housestaff education and professional development. Adnan Majid received a Young Investigator award at the Annual Meeting of the American College of Chest Physicians. Richard Schwartzstein received the Alpha Omega Alpha Robert J. Glaser Distinguished Teaching Award from the Association of American Medical Colleges. Dr. Schwartzstein was also voted the Outstanding Preclinical Instructor, by Harvard Medical School Class of 2008.

● Selected Publications

Howell MD, Donnino M, Clardy P, Talmor D, Shapiro NI. Occult hypoperfusion and mortality in patients with suspected infection. *Intensive Care Med* 2007; 33:1892-9.

Patel NR, Zhu J, Tachado SD, Zhang J, Wan Z, Saukkonen J, Koziel H. HIV impairs TNF-mediated macrophage apoptotic response to *M. tuberculosis*. *J Immunol* 2007; 179:6973-6980.

Tachado SD, Zhang J, Zhu J, Patel N, Cushion M, Koziel H. Pneumocystis-mediated IL-8

Ernst A, Majid A, Guerrero J, Boisselle P, Loring S, O'Donnell C, DeCamp M, Herth F, Gangadharan S, Ashiku S. Airway Stabilization With Silicone Stents for Treating Adult Tracheobronchomalacia: A Prospective Observational Study. *Chest* 2007; 132:609-616.

Tager AM, LaCamera P, Shea BS, Campanella GS, Selman M, Zhao Z, Polosukhin V, Wain J, Karimi-Shah BA, Kim ND, Hart WK, Pardo A, Blackwell TS, Xu Y, Chun J, Luster AD. The lysophosphatidic acid receptor LPA1 links pulmonary fibrosis to lung injury by mediating fibroblast recruitment and vascular leak. *Nat Med* 2008; 14:45-54.

Huang J, Tamisier R, Ji E, Tong J, Weiss JW. Chronic intermittent hypoxia modulates nNOS mRNA and protein expression in the rat hypothalamus. *Respir Physiol Neurobiol* 2007; 158:30-38.

Tamisier R, Hunt BE, Gilmartin GS, Curley M, Anand A, Weiss JW. Hemodynamic and muscle sympathetic nerve activity after 8 h of sustained hypoxia in healthy humans. *Am J Physiol Heart Circ Physiol* 2007; 293:H3027-3035.



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● Drs. Ron Silvestri and Sarah Schellhorn.

release by macrophages requires co-expression of mannose receptors and TLR2. *J Leuk Biol* 2007; 81:205-211.

Schwartzstein RM, Huang GC, Coughlin CM. Development and implementation of a comprehensive strategic plan for medical education at an academic medical center. *Acad Med* 2008; 83:550-559.

Banzett RB, Pedersen SH, Schwartzstein RM, Lansing RW. The affective dimension of laboratory dyspnea: Air hunger is more unpleasant than work/effort. *Am J Respir Crit Care Med* 2008; 177:1384-1390.

Thomas RJ, Mietus JE, Peng CK, Gilmartin G, Daly RW, Goldberger AL, Gottlieb DJ. Differentiating obstructive from central and complex sleep apnea using an automated electrocardiogram-based method. *Sleep* 2007; 30:1756-69.

● Faculty

Amit Anand, MD	Henry Koziel, MD
Robert Banzett, PhD	Peter LaCamera, MD
Jacqui Chang, MD	Naimish Patel, MD
Peter Clardy, MD	Melanie Pogach, MD
David Delaney, MD	David Roberts, MD
Michael Donnino, MD	Laura Rock, MD
Armin Ernst, MD	Richard Schwartzstein, MD
Diana Gallagher, MD	Ronald Silvestri, MD
Norma Gerard, PhD	Robert Thomas, MD
Geoffrey Gilmartin, MD	J. Woodrow Weiss, MD
Sean Gilman, MD	Joseph Zibrak, MD