



## Pulmonary Clinics Update

**T**he clinical programs of our section are extensive and diverse.

Through our various clinics, on average we annually staff 12,000 in-patient daily visits, 10,000 out-patient visits, and 1,000 medical procedures. In addition, research in the Pulmonary Center is elucidating the biology of healthy lungs, discovering mechanisms responsible for pulmonary disease, analyzing the efficacy and limitations of current pulmonary and critical care practices, and translating these findings to yield clinical advances. Take a look to learn more about the various clinics offered here at the Pulmonary Section, and about their associated research.

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# Alpha-1 Antitrypsin Center



The Alpha-1 Center at Boston University and Boston Medical Center ([www.bu.edu/alpha-1](http://www.bu.edu/alpha-1)) is an integrated program that combines patient care, translational bench research, and clinical-epidemiological research to advance understanding of and care for patients with alpha-1 antitrypsin deficiency (AATD). The Center was founded in 2012 by Drs. Darrell Kotton (shown above on the left) and Andrew Wilson (shown above on the right), the clinic director, and has grown to become one of the largest regional centers for the care of AATD patients. Research at the Alpha-1 Center is focused in 3 categories: 1) Patient stem cell repositories: we have created and direct two large patient stem cell repositories. First, we house the world's largest AATD patient-specific induced pluripotent stem cell (iPSC) repository, comprised of iPSCs and reprogrammable blood samples from over 150 AATD patients. Second, we are the official repository for iPSCs and reprogrammable blood samples for the Framingham Heart Study (FHS) and house samples >6500 FHS participants. 2) Translational bench research: Our labs, housed in the Center for Regenerative Medicine (CRoM) are focused on the application of patient-derived iPSCs to study AATD and COPD. Our primary interests are to better understand the genetic factors and mechanistic drivers that predispose subsets of AATD patients to develop clinical disease, to elucidate the mechanistic contribution of putative COPD susceptibility genes to lung disease pathogenesis, and to develop gene or cell-based therapies for AATD. 3) Clinical-epidemiological AATD Research: Boston University is one three sites in a multi-center study funded by the Alpha-1 Foundation to define the prevalence of, risk factors for, and non-invasive biomarkers associated with AATD-associated liver disease. Collectively, the three sites have recruited >100 study participants who have undergone liver biopsies and are being followed for 5 years.



## TB Clinic



The tuberculosis (TB) clinic at Boston Medical Center (Boston University School of Medicine) is a collaboration between the Pulmonary and Infectious Disease departments and the Boston Public Health Commission (BPHC). The TB clinic is the largest in Massachusetts, caring for over a thousand new patients annually, including on average 40 cases of active tuberculosis. Patients are referred to the TB clinic from multiple hospitals and community-based clinics in the greater Boston area.

The staff of the TB clinic is comprised of physicians with expertise in both infectious disease and pulmonary medicine, nurses and outreach workers from the BPHC and a variety of language interpreters. The clinic provides initial TB screening, diagnosis and management, including management of complex cases of multi drug resistant tuberculosis.

### Clinical Activities:

- Evaluation of patients with positive TB screening tests (PPD, Quantiferon, T-spot)
- Treatment of patients with Latent TB Infection (LTBI)
- Evaluation and management of contacts of patients with active TB, as identified by the BPHC
- Diagnosis and management of patients with active TB, including multidrug resistant strains of TB
- Management of complications related to TB medications

BPHC TB website<<http://www.bphc.org/whatwedo/infectious-diseases/Tuberculosis/Pages/Tuberculosis.aspx>>



## Lung Cancer Screening Center

The Lung Cancer Screening Center, co-directed by Drs. Katrina Steiling (pulmonary) and Anu Rebello (radiology), has entered its 5<sup>th</sup> year of operation. Launched in March 2015, this high-volume screening center performs ~150 screening CTs per month. The Lung Cancer Screening Center is closely integrated with the Lung Nodule Clinic (Dr. Steiling), Advanced Bronchoscopy Service (Dr. Billatos), and Tobacco Treatment Center (Dr. Kathuria). Together, these programs serve as a focal points for cutting edge clinical care and research for early lung cancer detection and treatment.





## Sleep Disorder Center

The Sleep Disorders Center at Boston Medical Center, accredited by the American Association of Sleep Medicine (AASM), is a joint Neurology (Dr. Sanford Auerbach) and Pulmonary (Dr. Hasmeena Kathuria) program that provides comprehensive diagnosis and treatment services for individuals with all types of sleep problems including but not limited to obstructive and central sleep apnea, snoring, restless legs syndrome, insomnia, narcolepsy, abnormal behaviors during sleep, disruption of sleep/wake cycle and circadian rhythm and parasomnias. Our new sleep laboratory is located at the Crosstown Center at the BU Medical Campus and performs overnight sleep studies every night of the week.

Ongoing research in the Pulmonary Center include the characterization of sleep disordered breathing in patients with sickle cell disease (Dr. Elizabeth Klings) and the effectiveness of secondary prevention interventions of Atrial Fibrillation, including treatment of sleep disordered breathing.



## Tobacco Treatment Center/ COPD Readmissions Program



The **Tobacco Treatment Center**, directed by Dr. Hasmeena Kathuria, is a program that brings together a multidisciplinary team of health professionals who specialize in helping individuals with tobacco dependence stop smoking. Our team provides tobacco dependence consultation on >1500 individuals each year. Our research focuses on reducing health disparities by developing, implementing, and studying the outcomes of innovative programs that focus on teachable moments to promote health behavior change in tobacco use, the leading cause of preventable disease worldwide. Members of our team help organize local and national educational, advocacy and policy activities relating to tobacco use, including the national dialogue on tighter FDA regulations of flavoring in nicotine-delivery devices and juuling, a type of vaping device whose use has become an epidemic in youth.

The **COPD Readmissions Program**, directed by Dr. Frederic Little (shown right), in collaboration with the BMC Strategy Team, is an integral part of an expanding initiative aimed at improving lung health and wellness along with the Lung Cancer Screening and Tobacco Treatment Centers. Given the clinical features of chronic airflow obstruction, there is additional close integration with the Sleep Disorders Center in providing positive airway pressure (PAP) therapy in suitable patients. Using a multidisciplinary

approach with early inpatient intervention and close outpatient follow-up amongst physicians, NPs Alexis Gallardo Foreman and Cornelia Wakeman, and our Community Health Worker Jinessa Howard, BA, we have been able to reduce 30-day readmissions due to COPD. Building on this success and care model, the Program has expanded scope beyond reducing 30-day readmissions to improving hospital-free days on the longer term.

## Amyloidosis Center



The Amyloidosis Center at BMC is one of the world's largest and longstanding clinical and research amyloid centers of excellence. The Amyloid Clinic functions as a multi-disciplinary operation featuring 2 primary care providers, 3 cardiologists, 3 hematologists, 3 neurologists, 3 nephrologists, 1 otolaryngologist, 1 radiation oncologist, 1 urologist, 1 rheumatologist, and 1 pulmonologist -- all extensively published and expert in amyloid disease. Patients are seen by multiple specialists who convene at the end of every week to discuss their findings and generate a consensus treatment recommendation. Over 800 patient visits are recorded each year. The clinical activities fuel our basic science laboratory and clinical research through collection and banking of tissue





samples from over 2,000 patients. The laboratory has reported numerous gene mutations forming the basis of protein misfolding in patients with familial amyloid, published novel biophysical observations of amyloidogenic proteins, and described unique clinical presentations of various amyloid disease.

Despite representing orphan disease (<200,000 cases) in the US, the Amyloidosis Center has participated in or led international randomized clinical trials resulting in FDA approval of RNA interference and anti-sense oligonucleotide gene silencing therapies for hereditary transthyretin amyloid as well as protein stabilizing treatments. Additionally, we pioneered radiation treatment for tracheobronchial amyloidosis. We consult with patients and their physicians around the world.

## Sarcoidosis Center

The Sarcoidosis Center grew out of the TB and Pulmonary Clinic in 1995. Over the last 25 years the clinic has grown into a Multi-specialty regional Center of Excellence run by Drs. Jeffrey Berman (shown on the right below) and Praveen Govender (shown on the left below). This tertiary referral clinic sees 200-250 New Referral from around New England and further abroad. The clinic is one of the main referral centers for pulmonary sarcoidosis and its complications, neurosarcoidosis, cardiac sarcoidosis and other rarer disease manifestations. Boston Medical Center is now home to New England Sarcoidosis Center Support Group since 2016. In 2011 we joined the Black Women's Health Study which has published many important paper in this unique cohort most importantly on the increase mortality in African American women with a diagnosis of sarcoidosis. Yvette Cozier from the School of Public Health runs this collaboration and has also joined the Nurses' Health Study in 2016 to help understand sarcoidosis epidemiology in that cohort. A particular focus of the clinic is risk stratification for sudden death with the aid of advanced imaging and we published on the role of quantification of FDG uptake on cardiac PET in patients with sarcoidosis.





# Interstitial Lung Disease Clinic

**History:** The Boston Medical Center/Boston University Pulmonary Section has a long and proud history of clinical care and research in interstitial lung disease and pulmonary fibrosis dating back to the initial descriptions of UIP (usual interstitial pneumonia) and DIP (desquamative interstitial pneumonia) by Dr. Ed Gaensler and colleagues in 1975 (Carrington et al. 1978). Subsequent seminal work on the BMC/BU campus has included the description of bronchiolitis obliterans and organizing pneumonia (BOOP) (Epler et al. 1985) and a review of Dr. Gaensler's experience with chronic eosinophilic pneumonia (Jederlinic et al. 1988). The Pulmonary Center also developed the current animal model of human pulmonary fibrosis that is used worldwide to test the efficacy of potential treatments and develop insights into the pathogenesis of this disorder (bleomycin induced fibrosis in rodents).

More recently, The Pulmonary Center has pursued basic science advances in pulmonary fibrosis and participated in clinical trials to identify candidate treatments for idiopathic pulmonary fibrosis (IPF/UIP) and scleroderma ILD, led within Pulmonary by Dr. Arthur Theodore. With the recent surge in precision medicine research initiatives, the discovery of genetic associations with ILD subtypes, and the establishment of the BMC/BU Center for Regenerative Medicine (CRoM) and its national lung disease-specific stem cell repository (that includes induced pluripotent stem cells derived from ILD patients) BU launched a formalized advanced lung disease specialty clinic focused entirely on ILD and led by Dr. Finn Hawkins (shown below). The ILD clinic includes formalized integration of multidisciplinary state-of-the-art care and bench to bedside research initiatives focused on ILD.



Finn Hawkins, MD



Kostas Alysandratos MD, PHD

# Pulmonary Rehabilitation

The Pulmonary Rehabilitation program at Boston Medical Center (Boston University School of Medicine) is an outpatient program designed for patients with chronic lung disease who have dyspnea with exertion. The purpose of the program is to improve patients' quality of life and improve exercise capacity by providing education and exercise training to increase endurance and improve daily function. Patients are referred to the Pulmonary Rehabilitation program from medical providers throughout the greater Boston area.

The staff of the Pulmonary Rehabilitation program is comprised of physicians with expertise in pulmonary physiology, respiratory therapists, and exercise physiologists. The program provides a multidisciplinary team approach to our patients both on an individual as well as a group level. We routinely involve nutritionists, pharmacists, and smoking cessation specialists in the program to address a variety of patient needs. Our team consists of pulmonary specialists, respiratory therapists, exercise physiologists, nutritionists, pharmacists, and clinical social service workers.

Clinical activities in the Pulmonary Rehabilitation program include medical evaluations of all patients referred to the program, evaluation of medical emergencies that may occur during exercise sessions, assessment of 6-minute walk tests and pulmonary function tests, and interpretation of cardiopulmonary exercise tests. Additionally, fellows and faculty throughout the pulmonary section routinely lead the education sections on a variety of topics related to chronic lung disease.



Joseph Kaserman, MD

## Primary Immunodeficiencies Clinic

The emerging application of genomics to clinical medicine has greatly expanded our ability to recognize and define human diseases linked with specific genetic etiologies. Primary immunodeficiencies result from genetic errors of the immune system, the understanding of which has led to precision therapies and fundamental understanding of human immunology that greatly impacts patient care. While many primary immunodeficiency patients are diagnosed as children, advances in management now require care of these patients into adulthood. Moreover, nearly half of those with primary immunodeficiencies are diagnosed as adults, owing to diagnostic delay as well as the multifactorial basis of many of these disorders that result in later onset. Boston Medical Center established a Primary Immunodeficiencies Clinic to specifically meet the growing needs of those with genetic immune disorders.

The BMC Primary Immunodeficiencies Clinic offers detailed laboratory evaluation of the immune system, genetic analysis, and coordinated care with the Boston Medical Center Infusion Center to provide therapies. The Primary Immunodeficiencies Clinic is staffed by Miren Guenechea-Sola, MD, trained both adult and pediatric immunodeficiency, including bone marrow transplant, at UCSF and PJ Maglione, MD, PhD, who has clinical expertise and research program on primary antibody deficiency disorders, with particular interest in complications of common variable immunodeficiency (CVID). In addition to the joint clinic staffed by Drs. Guenechea-Sola and Maglione, primary immunodeficiency patients are also cared for by Dr. David Center, Dr. Fred Little, Dr. Praveen Govender, and Dr. Quindelyn Cook, with research efforts coordinated through the Primary Immunodeficiencies Clinic.



PJ Maglione, MD, PhD

# Sickle Cell Lung Disease Program



The Center for Excellence in Sickle Cell Disease (SCD) at Boston Medical Center/Boston University School of Medicine, under the direction of Dr. Elizabeth Klings (pictured right), is the largest center treating children and adults with SCD throughout New England. Currently 345 adults and 192 children and adolescents receive their care at BMC. The Center integrates clinical care, research and education in SCD to provide the best possible care for our patients while seeking to understand disease pathophysiology.

The Center has had a focus in the pulmonary vascular complications of SCD for over 20 years. Currently, the pulmonary program is led by Dr. Klings and Dr. Robyn Cohen (pictured left) of Pediatric Pulmonary. Dr. Klings treats and evaluates all adult patients with SCD within her own clinic. In 2018, she helped to launch a multi-disciplinary clinic within Hematology, attended by Hematology, Pulmonary and General Internal Medicine, that meets twice a month with the goal of providing comprehensive care for the patients.

## Clinical Areas of Focus:

- 1) Management of pulmonary hypertension of SCD
- 2) Acute and long-term management of venous thromboembolism
- 3) Evaluation of sleep-disordered breathing in SCD
- 4) Management of airways disease in SCD



# Pulmonary Hypertension Center



The Pulmonary Hypertension (PH) Center at Boston Medical Center/Boston University School of Medicine was created over a decade ago to enhance clinical care and research in pulmonary hypertension. The Center, under the direction of Dr. Elizabeth Klings (pictured left), is a multi-disciplinary program caring for patients with all forms of PH. Tertiary care referrals from across Massachusetts and beyond result in over 200 patients being treated annually.

The clinical program has four components: 1) Outpatient; 2) Inpatient; 3) Right Heart Catheterizations; and 4) Invasive Cardiopulmonary Exercise Testing. Outpatient care is led by Dr. Klings (Pulmonary) and Dr. Nir Ayalon (Cardiology- pictured right). Denise Curran (pictured left below), NP sees patients with Dr. Klings in the Pulmonary Clinic. Key populations treated at our center include PH related to: 1) Connective tissue disease, particularly systemic sclerosis (in collaboration with our Scleroderma Center and ILD program); 2) Sarcoidosis (in collaboration with the Sarcoidosis Center); and 3) Sickle Cell Disease.



The inpatient PH consult service is led by Dr. Klings and Dr. Hector Marquez (pictured right below) working with one of our clinical fellows. Inpatient consultations occur daily for questions concerning PH diagnosis, management of acute right sided congestive heart failure, and optimization of PH treatment regimens. Additionally, the PH consult service evaluates all patients with acute pulmonary emboli in consultation with Cardiology as part of the Pulmonary Embolism Response Team.

Right heart catheterizations are performed in the Invasive Procedure Labs by Drs. Klings, Marquez and Ayalon along with our pulmonary fellows. Approximately 100 right heart catheterizations are performed annually for diagnosis and management of PH.

The Invasive Cardiopulmonary Exercise Testing program, led by Dr. Ayalon of Cardiology, allows for assessment of cardiopulmonary hemodynamics with exercise. Tests are performed with senior pulmonary fellows who assist both with the testing and their interpretation.



# Adult Asthma Program

The Adult Asthma Program at Boston Medical Center provides a multidisciplinary diagnostic evaluation and tailored therapeutic plan for patients with asthma and related allergic lung disease, including allergic bronchopulmonary aspergillosis (ABPA) and hypersensitivity pneumonitis. Our mission is to improve the lives of patients living with asthma and allergic lung disease by providing state-of-the-art patient care.

The staff includes physicians who are double board-certified in Pulmonary Diseases (ABIM) and the American Board of Allergy and Immunology. As a result, testing/treatment for allergy to possible environmental triggers is ordered and interpreted in the clinic as part of our comprehensive care including allergy skin testing, allergy immunotherapy (allergy shots), anti- IgE therapy, and other more recently approved biologics. In addition, the team includes nurse practitioners who specialize in asthma disease management and training to provide targeted asthma education.



Our patient population is representative of our local community, with a significant representation of ethnic minorities. Our clinic cares for many high-risk patients who have more severe asthma than the population as a whole.



## Clinical Activities:

- Diagnosis and assessment of asthma severity
- Evaluation of asthma triggers
- Ongoing management of moderately severe and severe asthma
- Diagnosis and management of coexistent seasonal and perennial rhinitis due to allergies, nasal polyps, vasomotor rhinitis, and chronic sinusitis.

- Evaluation and treatment of other allergic lung disease
- Allergen skin testing
- Administration of specific immunotherapy (allergy shots), anti-IgE therapy (Xolair), and other recently approved biologics (e.g. Fasenra, Dupixent, Nucala)

## Thoracic Oncology Program

The Thoracic Oncology Center is a multidisciplinary program for patients with lung, esophageal, mediastinal, and chest wall tumors. Our pulmonary faculty and fellows are highly trained in preoperative assessment and bronchoscopic diagnosis of thoracic tumors. Important clinical and research efforts focus on the diagnosis, management and prevention of lung cancer. Through our combined state of the art research and clinical practices, the Boston University Center for Thoracic Oncology's mission is to reduce lung cancer incidence, morbidity, and mortality.

The Thoracic Oncology Center is a comprehensive program that provides a wide array of clinical and research services for lung cancer and other thoracic malignancies. The multidisciplinary team is composed of physicians experienced in thoracic surgery, medical oncology, radiation oncology, chest radiology, pathology, and pulmonary medicine. The team meets weekly to review diagnostic and treatment options for individual patients. Patients are seen or reviewed by an entire team of physicians experienced in this field.

Boston Medical Center is accredited by the American College of Radiology as a [Lung Cancer Screening Center](#). The high volume lung cancer screening program is aimed at detecting lung cancers at an early and potentially curable stage. The screening program is overseen by a multidisciplinary steering committee, led by pulmonology and radiology.

Boston Medical Center also performs a high volume of surgeries for thoracic malignancies including robotic and minimally invasive surgical techniques. Our surgeons work together with the medical and radiation oncologists to participate in multiple clinical trials and develop treatment plans at every stage of lung cancer. Together we also offer non-operative options, such as Stereotactic Body Radiotherapy (SBRT) for those patients with early cancers but at prohibitively high risk for surgical resection.

Boston Medical Center's pulmonologists play an integral role at the Thoracic Oncology Center. Faculty and fellows help care for patients with indeterminate pulmonary nodules in the Lung Nodule Clinic, and also help care for high-risk surgical candidates post-operatively through the consult service. Our dedicated pulmonologists along with senior pulmonary fellows join with the thoracic surgeons in multidisciplinary conference and clinic to provide preoperative assessment and [aid in bronchoscopic diagnosis](#) and staging of thoracic tumors.

Our pulmonologists and pulmonary fellows are at the forefront of basic, translational, and clinical research related to thoracic malignancies. At the research center, investigators are working to identify genes responsible for a predisposition to lung cancer so high risk patients can be targets for prevention and early detection. In our clinical research program, investigators are working towards better lung

cancer prevention and early detection by improving approaches to smoking cessation and lung cancer screening. In addition, researchers and clinicians work together to improve lung cancer outcomes through implementing patient-centered programs (e.g. [lung cancer screening](#) and [tobacco treatment center](#)) and studying the implementation of these programs.

Virginia Litle, MD



Kei Suzuki, MD



Katie Steiling, MD



Chris Reardon, MD



Ehab Billatos, M





## Pleural Disease Clinic

The Pleural Disease clinic at Boston University Medical Center, directed by Dr. Ehab Billatos (pictured below), is dedicated to the care of patients with complex diseases affecting the lining tissue of the lungs. We treat and manage patients with a variety of pleural diseases including but not limited to malignant pleural effusions, complicated parapneumonic effusions, empyema, chylothorax, pneumothorax, and trapped lung. This clinic allows fellows to become proficient in chest ultrasound, diagnostic and therapeutic thoracentesis, indwelling pleural catheter management, pleurodesis, and the work-up of intellectually challenging and interesting pleural cases. We work closely with thoracic surgery, thoracic oncology, and several other research programs whose aim is to better understand lung cancer diagnostics in pleural fluid.

Ehab Billatos, MD



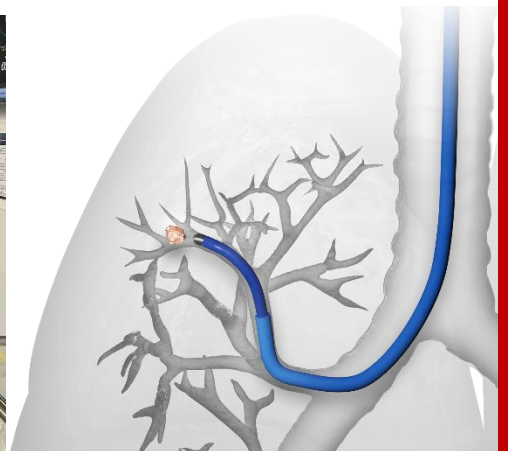
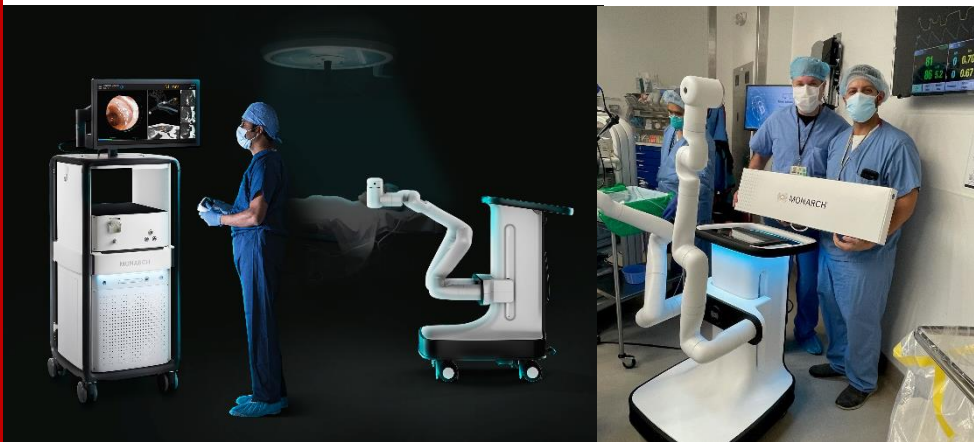
Samuel Belok, MD



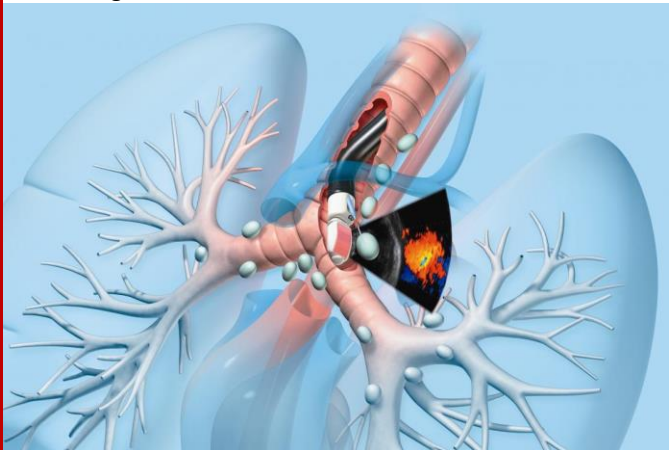
# Advanced Bronchoscopy Services

The Advanced Bronchoscopy service at Boston Medical Center is dedicated to the diagnostic aspect of various lung diseases. Our physicians regularly participate in research aimed at improving options for people with lung diseases. And our experts use the latest technology to provide the best care of patients. We routinely perform conventional bronchoscopy on patients with any number of lung diseases including but not limited to: interstitial pneumonias, lung infections like tuberculosis, malignancy, sarcoidosis, and other diagnostic dilemmas. In those patients with hilar or mediastinal lymphadenopathy (enlarged lymph nodes in the lung), we use endobronchial ultrasound with transbronchial needle aspiration (EBUS-TBNA) to biopsy these lesions – our most common diagnoses being malignancy (given our accreditation by the American College of Radiology as a Lung Cancer Screening Center) and sarcoidosis (given the referral base from our Sarcoidosis Center). In patients with peripheral lung nodules, we also use a new state-of-the-art Robotic-Assisted Electromagnetic Navigational Bronchoscopy called the Auris Monarch™ to help biopsy nodules, masses, and other lesions suspicious for cancer. This device enables us to access peripheral nodules endoscopically, give real-time visual guidance and feedback when sampling these nodules, and facilitate fine micromovements for precise targeting.

Robot Figures



EBUS Figures



# Division of Pulmonary, Critical Care, Allergy and Immunology, and Sleep Medicine, Boston VAHCS



The Division provides inpatient and outpatient care predominantly at the Boston VAHCS's West Roxbury campus, a referral site for care of veterans in Massachusetts, New Hampshire, Maine, Rhode Island and Connecticut. The Division provides inpatient consultation and bronchoscopy services, as well as staffing the Medical Intensive Care Unit. Outpatient services include Pulmonary Acute Care, Continuity, Allergy, and Sleep Clinics. First year Pulmonary Fellows and house staff from Boston University/Boston Medical Center rotate through the Pulmonary Acute Care and Continuity Clinics, and second year Pulmonary fellows have a Continuity Clinic at the VA. Brigham and Women's Pulmonary fellows rotate through the Acute Care Clinic and the MICU. The Sleep Clinic provides consultation, home and in-laboratory testing, and treatment of sleep disorders, with ongoing technical support.

VA Boston Healthcare System's Pulmonary Rehabilitation Program is a multidisciplinary clinical program for patients with chronic respiratory diseases. Through monitored exercise and education, it is individually tailored to optimize physical functioning and health-related quality of life.

Pulmonary Function Laboratories provide full testing, including cardiopulmonary exercise testing and methacholine challenge tests. Respiratory Therapy provides extensive inpatient and outpatient services. Dedicated nurse practitioners, nurses, respiratory therapists, and administrative staff are essential to the care provided to the patients.

The Division clinical services see a broad array of relevant illnesses, including COPD, asthma, interstitial and occupational lung disease, lung cancer, bronchiectasis, pulmonary infections (bacterial, viral, fungal, and mycobacterial), systemic diseases, sleep disorders, allergic rhinitis, immunodeficiencies, and others. Two main clinical conferences provide focal points for discussion of challenging or educational cases: the interdisciplinary Pulmonary Tumor Conference (Tuesday at 7:30 am with Radiology and Thoracic Surgery) and Pulmonary Clinical Conference (Friday at noon).

Major areas of clinical activity include, but are not limited to:

*Asthma, Allergy and Immunology:* Claire Murphy, NP, and David Sloane, MD. The Allergy/Immunology Clinic provides consultation, testing, immunotherapy, and administration of biologic therapies, including omalizumab, dupilumab, mepolizumab, and intravenous immunoglobulin. Allergy fellows rotate through this clinic. The Allergy Service has trained staff at multiple sites around New England to provide directed care, including through the extensive use of Telehealth.

*COPD and asthma:* All clinicians in the Division provide care for these diseases. Drs. Marilyn Moy and Dr. Eric Garshick are conducting research on the impact of pulmonary rehabilitation in COPD. Sohera Syeda, MD and Jussi Saukkonen, MD have interests in quality improvement, transitions in care, and Hospital in Home.

*Critical care:* The MICU service provides full-service critical care short of ECMO. Cases typically include sepsis, respiratory failure, cardiac disease with significant comorbidities, malignancy associated critical illness, acute alcohol withdrawal syndrome, and a broad variety of critical illnesses. Dr. Saukkonen has been studying the impact of phenobarbital in the treatment of alcohol withdrawal, as well as QI initiatives.

*Environmental and occupational pulmonary exposures:* Clinicians within the Division see significant numbers of patients who have had exposure to asbestos and other occupational exposures, as well as veterans with exposure to burn pits, dust storms, and other military-related environmental exposures. Dr. Eric Garshick has ongoing extensive research in this area.

*Interstitial lung disease:* A significant number of patients with ILD is seen in our clinics, including UIP, NSIP, CT disease-associated, occupationally-associated ILD, and other types. Cases are discussed in conference from diagnostic evaluation to therapeutic management. Drs. Saukkonen and Goldstein maintain ILD databases.

*Lung Cancer and Screening (LCS):* The Division has been conducting LCS since 2012 and currently has well over 2000 patients in the active LCS program, tracked by data base by dedicated staff. Incidental lung nodules are also tracked and evaluated and discussed in interdisciplinary conferences. Drs. Goldstein and Saukkonen are involved in this clinical and QI/implementation effort. Dr. Goldstein is a co-investigator in the DECAMP studies of premalignant conditions.

*Neuromuscular disease and respiratory failure:* Dr. Goldstein sees many of the patients with amyotrophic lateral sclerosis (ALS), providing assessment for respiratory compromise and for the initiation and maintenance of mechanical ventilation. Dr. Garshick has been studying patients with spinal cord injury and respiratory compromise.



*Pulmonary hypertension:* Patients of all WHO classification groups are seen, evaluated, and discussed in clinical conference, and management recommendations made, including use of oral, inhaled, or infused therapy. Drs. Goldstein and Brad Maron are conducting a randomized trial of pulmonary vasodilator therapy in pulmonary hypertension and COPD.

*Respiratory care and neuromuscular disease:* The Boston VAHCS has a Spinal Cord Injury Center and also provides care for many patients with amyotrophic lateral sclerosis (ALS) and other neuromuscular disorders. These patients have unique respiratory problems, including respiratory failure. All physicians provide care for these patients. Dr. Goldstein has acquired considerable experience in the care of ALS patients, while Dr. Garshick has worked extensively with the SCI patients.

*Pulmonary rehabilitation:* Full pulmonary rehabilitation services are provided through the program at the Jamaica Plain, Boston campus. Drs. Marilyn Moy and Eric Garshick conduct research on the impact of pulmonary rehabilitation on COPD. Dr. Moy is conducting a 4-year VA research study, to see if a web-based, pedometer mediated exercise program accessed from home, can improve the physical activity of patients with COPD.

*Sleep Medicine:* The Sleep Disorders Program at VA Boston serves as a tertiary referral center for sleep disorders for veterans throughout northern New England, performing over 1800 sleep studies annually and providing a full range of outpatient Sleep Medicine services. Drs. Daniel Gottlieb, Christine Fitzgibbons, and Ting Chen provide Sleep Medicine consultation, evaluation and treatment of sleep disorders. Dr. Gottlieb is PI of a VA-funded study comparing nocturnal oxygen, adaptive servo-ventilation, and usual cardiac care for treatment of central sleep apnea in patients with heart failure, and co-Investigator on a Million Veterans Program study evaluating gene-environment interactions influencing risk of cardiovascular and metabolic disease.

*Bronchoscopy:* The VA Pulmonary service performs flexible bronchoscopy (all), endobronchial ultrasound (Drs. Goldstein, Chen, and Saukkonen), navigational bronchoscopy (Dr. Chen), and bronchial thermoplasty (Dr. Chen).

*Telehealth:* Allergy Service makes extensive use of Telehealth to evaluate and communicate with patients. This has been expanded to Sleep and will be shortly active for the Pulmonary Service, as well.

*Clinical Conferences:* There are two main weekly conferences, Tuesday morning interdisciplinary Pulmonary Tumor Conference, with Radiology, Thoracic Surgery, and Pulmonary; and Friday noon Pulmonary Clinical Conference. In the Pulmonary Tumor Board, cases for surgical biopsy, staging, and/or resection are discussed. In the second, challenging and interesting cases or those that warrant extensive consideration are discussed.