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How We Breathe: Applied Pulmonary Physiology Mini-Elective Spring 2019

<u>Course Dates:</u>	January 30, February 6, 13, 20, 27 Wednesdays, 5:00-6:30 PM
<u>Maximum Students:</u>	6
<u>Class Year:</u>	MS1 and MS2
<u>Course Director:</u>	Daniel Weiner, MD Medical Director, Pulmonary Function Laboratory Co-Director, The Antonio J. and Janet Palumbo Cystic Fibrosis Center Associate Professor of Pediatrics
<u>Contact Information:</u>	Daniel Weiner, MD daniel.weiner@chp.edu
<u>Registration:</u>	Betsy Nero, Office of Medical Education betsy@medschool.pitt.edu

Description:

This 5 week course will explore the principles of pulmonary physiology in the context of common pulmonary diseases, and provide hands-on experience with pulmonary measurements in the Pulmonary Function Laboratory. Students will have measurements on themselves to learn the principles of these techniques.

Objectives:

1. Understand how aberrations of pulmonary physiology cause or impact clinical disease states.
2. Understand how the measurements of pulmonary physiology are made.
3. Understand how pulmonary physiology can guide diagnosis and treatment.

Requirements:

Attendance at a minimum of 4 sessions is expected.

Pre-Requisites:

None

Course Outline

How We Breathe: Applied Pulmonary Physiology

Course Director:

Daniel Weiner, MD

Course Faculty:

Daniel Weiner, MD—Division of Pulmonary Medicine
Geoffrey Kurland, MD—Division of Pulmonary Medicine
Jonathan Spahr, MD—Division of Pulmonary Medicine
Sandeep Puranik, MD; Sylvia Szentpetery, MD—Division of Pulmonary Medicine
Cameron Dezfulian, MD—Department of Critical Care Medicine
Shekhar Venkataraman, MD—Department of Critical Care Medicine
Michael Wolfe, MD – Department of Critical Care Medicine
Al Saville, RRT—Respiratory Therapy, Children’s Hospital of Pittsburgh
Steven Walczak, RRT—Supervisor, Pulmonary Function Laboratory, Children’s Hospital
Paul Rebovich, MS—Exercise Physiologist, Children’s Hospital of Pittsburgh

Location:

All Sessions—Children’s Hospital of Pittsburgh - 6th floor, Pulmonary Function Laboratory
5:00—6:30 PM

Session I: Obstructive Lung Diseases —January 30, 2019 (Weiner, Saville)

- Understand the principles of airflow resistance, and diseases characterized by increased resistance (asthma, CF).
- Understand how airflow resistance is measured in plethysmography or with impulse oscillometry.
- Understand how spirometry demonstrates airways obstruction.
- Understand determinants of laminar & turbulent airflow, and effects of Heliox.
(*Students will perform spirometry§, breathe air/heliox with imposed resistances§*)

Session II: Restrictive/Interstitial Lung Diseases —February 6, 2019 (Weiner)

- Understand principle of compliance, and disease states characterized by decreased lung compliance- RDS or ARDS, surfactant gene mutations.
- Understand how compliance is measured—single breath occlusion technique, esophageal catheter technique.
- Understand principles of surface tension.
- Understand how gases (oxygen, carbon dioxide) are transported in the lung, and disease states of impaired diffusion (eg interstitial lung disease).
- Understand how diffusing capacity is measured.
- Understand how lung volumes are measured (body plethysmography, dilutional techniques) and diseases characterized by abnormal lung volumes.
(*Students will perform single breath diffusing capacity measurement§, plethysmography§*)

Session III: Exercise Testing— February 13, 2019 (Rebovich)

- Understand how gas exchange measurements are used in cardiopulmonary exercise testing and how this can be used to assess causes of exercise intolerance.
(*Students will perform measurements of gas exchange during exercise*)

§Hands-on demonstrations

Session IV: Testing in Infants—February 20, 2019

(Weiner)

- Understand the Rapid Thoracic Compression, Raised-Volume Rapid Thoracic Compression, and infant plethysmography techniques.
- Understand the Forced Deflation technique for testing mechanically ventilated infants/ children.
- Discuss other tests in infants/children—Respiratory Inductive Plethysmography, Lung Clearance Index.

(Students will visit the Infant Pulmonary Function Laboratory to examine the equipment used for these measurements)

Session V: Applications in Mechanical Ventilation—February 27, 2019

(Wolfe, Saville)

- Understand how mechanical ventilation can be guided by assessment of pulmonary mechanics and ventilator graphics.
- Understand basics of invasive and non-invasive mechanical ventilation.

(Students will use a mechanical ventilator and lung model)