# Point of Care Lung V/Q Scan

GE Research

## Project Team


David Davenport – Principal Investigator
Tzu-Jen Kao, PhD – EIT Technical Lead
*GE Research – Niskayuna, NY*

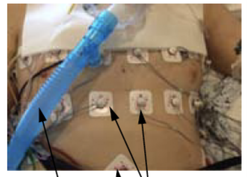
Robert Licho, MD – Clinical Partner Site PI
Michael King, PhD – Clinical Data Lead
*University of Massachusetts Medical School – Worcester, MA*


## Motivation

Ventilation/Perfusion (V/Q) matching is highly relevant to monitoring respiratory function of mechanically ventilated COVID-19 and ARDS patients. V/Q scans are performed with nuclear imaging and are rarely used for critically ill patients. There is a need for a new, continuous, bedside V/Q scan to guide respiratory therapy and improve patient outcomes.

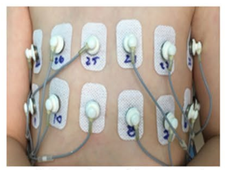
## Project Goals

- Validate SMS-EIT derived lung Ventilation/Perfusion distributions with SPECT-CT V/Q scans on 20 patients.
- Evaluate workflow efficiency using electrode textile applicator patches.
- Engage with clinicians to validate unmet needs for respiratory monitoring of mechanically ventilated patients.

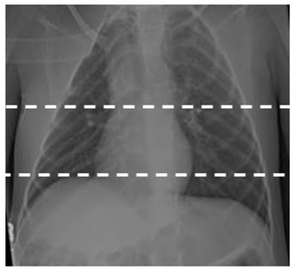


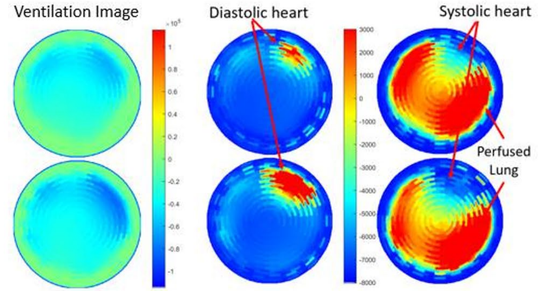

| Subject ID and related CH X/CT report | Correlated Ventilation Images | CT Images | Correlated Pulsatile Perfusion Images |
|---|---|---|---|
| **PT_04: (Supine position) Diagnosis: Pneumonia, and RLL Atelectasis**<br>Bilateral moderate pulmonary edema, moderate right pleural effusion, small left pleural effusion. | -2.5×10⁴ -2.5×10⁴ | | -100 3000 |

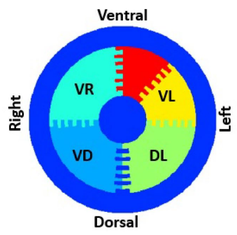
A 5-year old SMA-1 patient



Collaboration with CSU and CHCO at Colorado

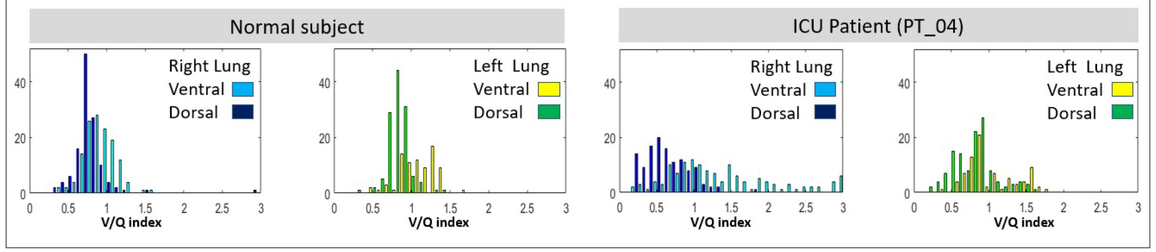





Regional VQ-index is computed by sums of the voxels p in four quadrants of the lungs:
VL: Ventral-Left
VR: Ventral-Right
DL: Dorsal-Left
DR: Dorsal-Right
The cardiac regions (red) and surface / central regions (blue) are not analysed.

| VQ-Index / Region | Healthy Subject *Mean (StDev)* | ICU PT_04 *Mean (StDev)* |
|---|---|---|
| Global | 0.88 (0.24) | 0.97 (0.57) |
| Ventral Left | 1.11 (0.23) | 1.05 (0.34) |
| Dorsal Left | 0.81 (0.14) | 0.79 (0.28) |
| Ventral Right | 0.93 (0.19) | 1.40 (0.74) |
| Dorsal Right | 0.75 (0.25) | 0.61 (0.29) |




## Pilot Study Findings

Our data from neonate, pediatric and adult patients demonstrates the capability of our SMS-EIT to generate physiologically relevant lung ventilation and perfusion images. We have defined a ***novel V/Q-index parameter*** from these impedance images and shown agreement with lung pathophysiology observations from X-ray and CT-scans.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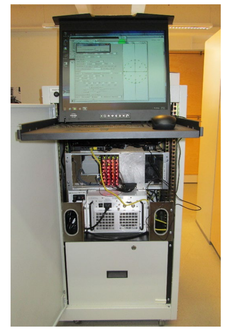
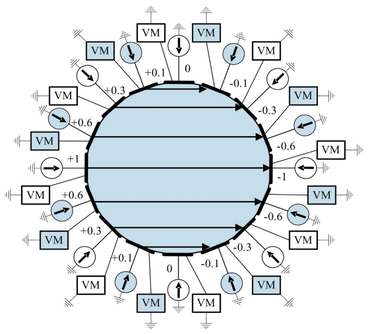
## What is SMS-EIT?

Electrical Impedance Tomography (EIT) is a non-invasive, non-ionizing imaging technology that estimates electrical properties inside the body using measurements from surface electrodes.

GE Research developed a novel, ***simultaneous multi-source EIT*** (SMS-EIT) with 32 independent channels. Each channel consists of individual current source and voltage measurement circuits.






*SMS-EIT clinical prototype (left); Independent channels enable generation of current patterns to optimally measure impedance within the body (right)*

## Advantage of SMS-EIT

Our SMS-EIT design provides uniquely greater sensitivity to image pulmonary perfusion in addition to ventilation.

SMS-EIT can generate images of lung ventilation, perfusion, and V/Q ratio maps in real time – ***breath to breath and beat to beat*** – without injected contrast or prolonged breath holding.

For more clinical results and our latest development, please visit our project website https://www.ge.com/research/project/electrical-impedance-tomography-eit-lung-monitoring.