New image processing technique improves pulmonary embolism diagnosis

Pulmonary embolism, a life-threatening condition that occurs when an artery in the lung becomes blocked, is the third most common cardiovascular emergency. Current methods of diagnosis, such as CT angiography and nuclear medicine imaging, can’t be used with some patients or require access to specialized clinics.

The Solution

Beaumont Health System team Edward Castillo, Ph.D., Thomas Guerrero, M.D., and Danielle Turner-Lawrence, M.D., have developed Respiratory-Induced Blood Mass Change (RIBMC) imaging, a new technology that uses cutting-edge mathematical modeling and image-processing algorithms to quantify pulmonary perfusion (blood flow within the lungs) from conventional Three Dimensional Computed Tomography (3DCT).

RIBMC imaging measures the subtle changes in blood mass that occur within the lungs as the patient breathes. Perfusion defects caused by a pulmonary embolism are detectable on RIBMC as regions with low mass change. Because PE is associated with high short-term mortality, a timely and accurate diagnosis is critical. RIBMC imaging allows the results to be acquired in minutes on existing equipment and does not require transporting the patient outside of the Emergency Department.
**Imaging technology** reduces time needed to diagnose pulmonary embolism

**Significant Need**
Pulmonary embolism is a major health problem in the United States. Mortality for the condition is between 10-30% if left untreated, but can be reduced to 2-8% with prompt treatment. Current diagnosis strategies rely on imaging modalities that are not safe for large segments of the population or require a long acquisition time.

**Compelling Science**
RIBMC imaging provides a high-resolution spatial map of the subtle changes in lung blood mass that occur throughout the breath cycle, which allows for the identification of pulmonary perfusion defects, such as those induced by PE.

**Competitive Advantage**
RIBMC imaging does not require a contrast agent and is generated using a standard CT scanner, such as those already available in most emergency centers. Its software implementation can easily be integrated into standard picture archival and communication systems (PACS) or deployed as a cloud-based tool to assist a radiologist in screening for pulmonary embolism.

**MTRAC Project Key Milestones**

- Retrospective analysis of automated diagnosis algorithm
- Conduct prospective study to determine the specificity and sensitivity of the method
- Determine FDA regulatory classification and approval path
- Prepare and submit publications
- Determine the appropriate commercialization strategy through conversations with existing companies and industry investors

**Overall Commercialization**

- PCT patent filed for RIBMC technology; two new invention disclosures being pursued.
- Determining best route to market – licensing to existing companies or forming a start-up around a standalone image analysis platform.

**Product Launch Strategy**
First indication for pulmonary embolism detection. Potential other markets in lung ventilation and perfusion imaging, e.g., interstitial pulmonary fibrosis.

**Regulatory Pathway**
Anticipate FDA 510(k) pathway.