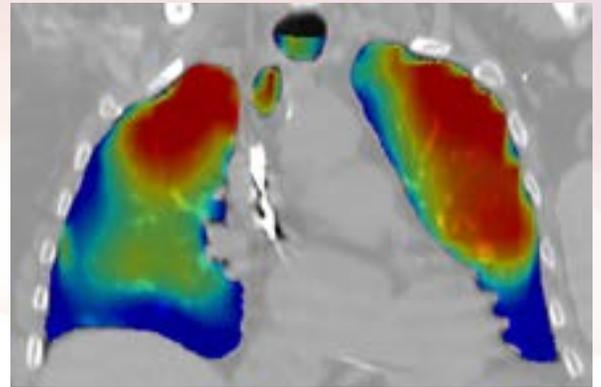


# Newsletter

November 2019

## Stage One Updates

ALHI's first round of XVD Gen 1 proof of concept studies were successfully completed this month, on schedule with ALHI's Stage One timeline of research activities. Projects were conducted at ALHI partner facilities SAHRMI (South Australian Health & Medical Research Institute) and NIF (National Imaging Facility) in early October, following the installation of 4Dx's Permetium™ preclinical scanner at SAHMRI in September.



As Stage One of the MRFF-funded project progresses, ALHI's goal for the proof of concept studies is to record data that will support a detailed research plan for Stage Two funding.

A Steering Committee overseeing the technical aspects of the entire project convened in late July and kicked off activities with an initial meeting in mid-August. Chief investigators from each ALHI partner were appointed and then tasked with recruiting and forming individual teams of mechanical,



Pictured above (L to R): University of Adelaide research partners Dr Martin Donnelly and Assoc Prof David Parsons, 4Dx staff members Steven Khanlou and Dr Jon Dusting.

### Member Spotlight: 4Dx

As lead partner of ALHI, 4Dx has had a very busy Q1 working with ALHI partners on proof of concept studies.

The core concept behind ALHI's proposed Gen1 and Gen2 lung scanners is based upon 4Dx's patented AI-based software platform, XV Technology™.

ALHI partners are working to design a pipeline of imaging devices that are integrated with 4Dx's XV Technology™ imaging software, which employs AI and image-processing algorithms utilised in aerodynamic engineering to image lung function in four dimensions throughout the course of a patient's breath. The mission of ALHI's research plan is to start with the development of two generations of scanners; Gen1 being an imaging system where the patient can be upright and seated normally, and Gen2 designed to be an entirely portable unit with near zero-dose radiation.

The portability and virtually zero-dose radiation exposure of both units will allow many patient groups who cannot undergo traditional scanning methods (infants, the elderly, disabled, obese and critically ill) the accessibility to advanced lung scanning which is imperative for earlier disease detection. The ultimate goal to refine the technology to create a zero dose scanner will be a world-first innovation, and will answer a critically unmet need in paediatric medicine.

### Rooted in Aerodynamic Engineering

The founding of 4Dx came about from Prof. Andreas Fouras' research studies at Monash University in Melbourne, Australia. As the youngest professor ever to teach at Monash, Andreas started his career in academic research studying experimental fluid dynamics in the Department of Mechanical and Aerospace Engineering. His early studies in wind tunnel quantification placed him as a young leader in the area



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**(cont.)** research and software engineers who will ultimately be responsible for the research and design of initial prototypes of ALHI's proposed Gen1 and Gen2 scanners (based on 4Dx's software platform, XV Technology™).

## Next Steps

The Science Committee and project teams will work through the remainder of Q2 (ending Dec. 31) to finalise XVD concept design and complete hardware requirements and software specifications prior to engineering modelling, simulation and CAD design to take place starting in January 2020.



## ALHI Members Out & About

In August, Prof. David Parsons of the University of Adelaide spoke on behalf of ALHI at the 13th Australasian Cystic Fibrosis Conference at the Crown Towers Hotel in Perth.



**(cont.)** developed a number of new approaches to the imaging of gas and liquid flow.

"We would place models in a wind tunnel, then we would do this wind tunnel imaging with lasers and cameras and so on," recounted Andreas. "From that, my team would write software that would perform the quantitative analysis of those images to do things like calculate where there was turbulence, and how this aircraft or this vehicle was performing in the tunnel. And at the same time, I was rubbing shoulders with medical researchers who were talking to me about the difficulties they had in understanding or doing good quality functional imaging in the heart and lungs."

The core issue medical researchers had was rooted in the limitations of the only modalities available for lung disease diagnosis - spirometry, which measures the lungs' air capacity, and X-ray, which images the shape of the lungs. Neither of those options could track a person's breath and see where the air was going, and where it wasn't.

"I was able to put two and two together and extend and extrapolate the wind tunnel technology that I developed into this medical imaging technology. I had that idea in 2005."

From there, Andreas' research was devoted entirely to lung imaging, applying the principles of wind tunnel quantification to lung ventilation, leading to the development of XV Technology™. The ability to measure the movement of the lungs as opposed to the shape yields quantitative data at all pinpoint locations of the lungs during the breath cycle.

For more information on 4Dx, visit their website at [www.4Dx.com](http://www.4Dx.com).

## The Burden of Lung Disease

The negative effects of chronic respiratory diseases affect an astounding number of people each year. In fact, four of the most prominent respiratory diseases are amongst the global top 10 causes of death. Doing the math, that means one in every six deaths is caused by a respiratory condition or illness.

### Impact

In Australia alone, 7 million people (or 31% of our population) have some form of respiratory illness. The prevalence of chronic lung disease is growing at rapid speed due to smoking, genetics and environmental pollution, placing a health, social and economic burden on countries all across the world.

With lung disease, a huge economic burden is placed on society in the way of direct and indirect costs on a health care system. Here we share some selected key facts and statistics that may surprise you:

- COPD and lung cancer together are the 3rd leading cause of death in Australia
- The second most common reason for patients to visit their GP are for respiratory related illnesses
- In 2016-17 there were 11 million hospital admissions for respiratory disease, with the top two being asthma (492,128) followed by COPD (249,827).
- In 2016-17, more than 16.5 million prescriptions were dispensed for respiratory medicines to more than 3.5 million individuals with a cost to tax payers of \$471 million.
- Currently, the respiratory conditions with the heaviest burden on the Australian health system is asthma (492,128 cases) followed by COPD (249,827 cases).