Functional Respiratory Imaging: improving healthcare in a post-pandemic world

JAN DE BACKER

Jan De Backer is CEO of Fluidda. Dr. De Backer graduated from Delft University of Technology, The Netherlands as an aerospace engineer. He attained an MSc degree in aerodynamics and specialized in applied biomedical computational fluid dynamics leading to a PhD from the University of Antwerp, Belgium. He is an alumnus of the MBA programs at London Business School, London and Columbia Business School, New York. Dr. De Backer has received several awards for his innovative research in the field of airway modelling in respiratory and sleep medicine. His work has been published in international journals. Dr. De Backer founded FLUIDDA in 2005 and he has held the position of Chief Executive Officer since 2007.

The COVID-19 pandemic accelerated the incidence and severity of lung disease, serving as a catalyst to search for more personalized and precise approaches for managing these patients. As an imaging technology that has been in the respiratory space for over 15 years and has FDA approval, Functional Respiratory Imaging (FRI) can serve as a pivotal tool to better inform disease diagnoses, treatment decisions, and clinical research discoveries.

Even before the COVID-19 pandemic, there were a considerable number of respiratory patients receiving suboptimal treatments. "I think one of the reasons why the pandemic was so severe, especially the first waves, is that we probably didn't take care of these patients optimally," says Dr. Jan De Backer, CEO of Fluidda. "As the world gets ready to evaluate the lessons learned from the past two years, it is our responsibility to look back and ask: *What happened? Can we do better?*"

NEW TECHNOLOGIES IN RESPIRATORY MEDICINE

"In the respiratory space, the use of technology is still at a fairly low level," says De Backer. "The gold standard is still spirometry. I think it's time to reassess and see if we can use technology in a way that really improves the lives of patients." With that aim, Fluidda's FRI technology reconstructs a 3D map of the lungs from CT scans, which can inform physicians on disease states, efficacy of medications, and more.

FRI entered the respiratory space in 2005, used mainly as an imaging tool for exploratory endpoints in clinical trials. Unlike spirometry, which can take up to six months to demonstrate changes in lung function, FRI can show changes in a matter of weeks. In recent years, Fluidda's technology has taken center-stage as a source of primary endpoints of clinical trials. New treatments are being tested for severe asthma patients, and FRI is being used as a primary endpoint to examine efficacy of those medications. "Fluidda has become the go-to party for pharmaceutical companies to study these new drugs" explains De Backer. "These large clinical trials are giving clinicians more exposure to the technology and building on the current evidence."

FROM CLINICAL TRIALS TO CLINICAL PRACTICE

In 2020, the FDA approved FRI as a diagnostic support tool, under the name *Broncholab*. This approval has opened the door for bringing the technology into clinical practice. De Backer explains, "Fluidda is currently the company that has been doing clinical trials with interventions the longest in the imaging space. We have a pretty good idea about what the typical drugs and devices are doing in terms of changing airways, blood vessels, ventilation, etc. This puts us in a position where we can use the technology to start linking the knowledge from those clinical trials to the application in clinical practice." The number of physicians who recognize the potential of new diagnostic technologies like Broncholab also increased during the pandemic, making this the ideal time for technology-based approaches to enter routine clinical practice.

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CARDIOPULMONARY REHABILITATION

FRI has the potential to facilitate new approaches in cardiopulmonary rehabilitation. "When you think about the future of cardiorespiratory medicine, especially in a post-pandemic world, rehabilitation will play an important role," explains De Backer. "Research has shown that rehabilitating respiratory patients has resulted in a considerable improvement in respective clinical outcomes." Currently, this approach is highly underutilized because it involves putting the patient in a rehabilitation center, giving them an exercise regimen, and then following-up with them periodically. Although effective, these treatments face scrutiny and are rarely adequately reimbursed by insurance companies. "As the number of long-COVID patients compounds the burden from respiratory patients receiving sub-optimal treatment before the pandemic, the demand for new therapeutic approaches in the respiratory space will increase. We believe that currently the only thing that works for them is a rehabilitation program based on technology and better diagnostics, like FRI," explains De Backer. "A tailor-made program that promotes the best possible condition is the goal."

Schematic Workflow Broncholab

FDA APPROVED

PACS

CLIENT uploads DICOMS from its PACS system into a GATEWAY , installed on CLIENT-side.

1. DICOM

The GATEWAY will remove most personal data (partial anonymization). The limited personal data processed, needed to re-identify the subject data will be encrypted. The encryption keys resides on the GATEWAY CLIENT-side.

2. DATASET

The DICOMs partially anonymized expect for the encrypted pre-defined personal tag.

3. REPORT

FLUIDDA analysis containing the encrypted pre-defined personal tags.

4. REPORT

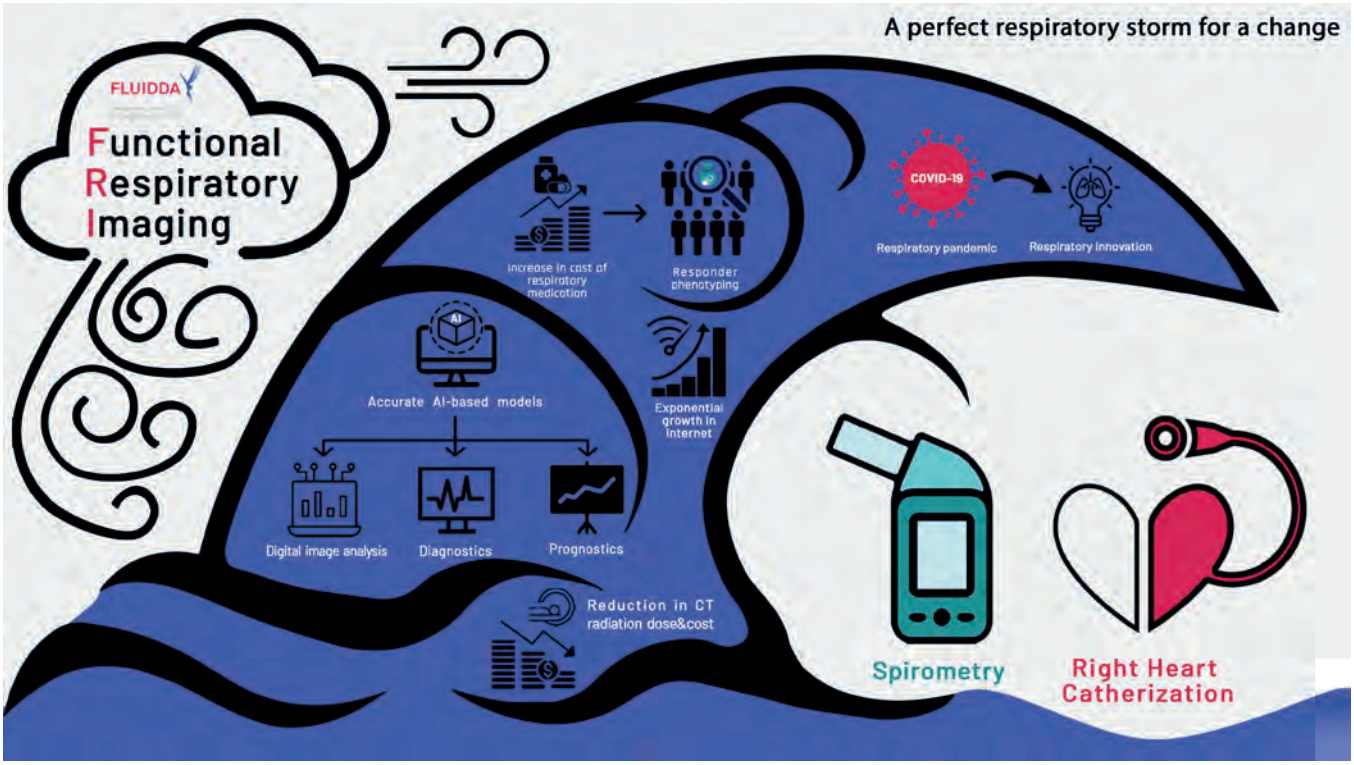
GATEWAY on CLIENT-side will decrypt pre-defined personal tags contained on the REPORT and match the REPORT to the correct subject in the PACS.

CLOUD-TRANSFER

Transfer of the data via Ambra Health company , a third-party cloud provider.

FLUIDDA

Fluidda will analyze the DATASET and return the processed DATASET, in the format of a REPORT.



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A HEALTH-WEARABLE APPROACH FOR RESPIRATORY HEALTHCARE?

Health-wearables and associated apps linked with exercise equipment read-outs could potentially serve the unmet needs of healthcare. Currently, medical interventions are unlikely to be informed by these tools, but it is possible to use these innovative technologies to improve health. De Backer explains a possible scenario, "Starting with a baseline health-assessment using a Broncholab analysis, physicians could then use the information gathered from clinical trials and clinical practice to predict the best course of action. Once the assessment is done, a regimen could be assigned that includes wearables to monitor things like heart-rate, oxygenation level, etc."

Optimizing rehabilitation centers' infrastructure to manage patients' wearables-data would allow patients to gain access to a more personalized approach to health. "Coming out of a pandemic where even young, healthy, non-smoking people were affected gives us an opportunity to use technology to bring these worlds closer together to create value for all patients," concludes De Backer.