Cystic Fibrosis Urine Test

Medtech & Diagnostics

Quantification of therapy success in CF patients treated with novel CF modulator drugs

Cystic Fibrosis (CF) is the most common lethal genetic disease in Caucasians with a frequency of ~1 in 2000 newborns caused by loss of function of the Cystic Fibrosis Transmembrane Regulator gene (CFTR). Treatment with CF modulator drugs provides increased quality of life and improved survival.

Oswald Hut

CF therapeutics are extremely expensive. Currently, only limited functional testing of therapy outcome is performed due to limitations in available the diagnostic tools.

We are developing a simple urine test to solve this.

Technology Description

The present invention relates to a CF urine test allowing quantification of the function of CFTR in CF patients by measuring challenged HCO_3^- excretion.

We are working towards developing the biomarker into a diagnostic tool, which from a measurement of the biomarker in a urine sample and an algorithm can provide patients and clinicians with a clear classification of the disease status. It will thereby be possible to quantify therapy success in patients treated with novel CF modulator drugs.

Intellectual Property Rights

European patent application filed May 8, 2019.

Team

Project Coordinator:

MS Ph.D
Mads Vaarby Sørensen

Coordinators of clinical trials:

MD
Peder Berg

Prof. Dr. med.
Jens Leipziger

Current State

Proof of concept has been generated on a small cohort of CF patients (ΔF508 homozygote genotype).

A larger multi-centre CF patient cohort with different genotypes is being established and the urine test is applied to the CF patients.

Business opportunity and Call to action

We are looking for partners to join us in creating a clinical approved diagnostic tool based on the identified biomarker.

A prototype device has been built. The next step is the creation of an easy to use device that allows detection of the biomarker in urine samples from patients.

DANISH **IP** FAIR
Inventions from Danish Research Institutions

AARHUS UNIVERSITY

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Point-of-care quantification of small molecule drugs in blood

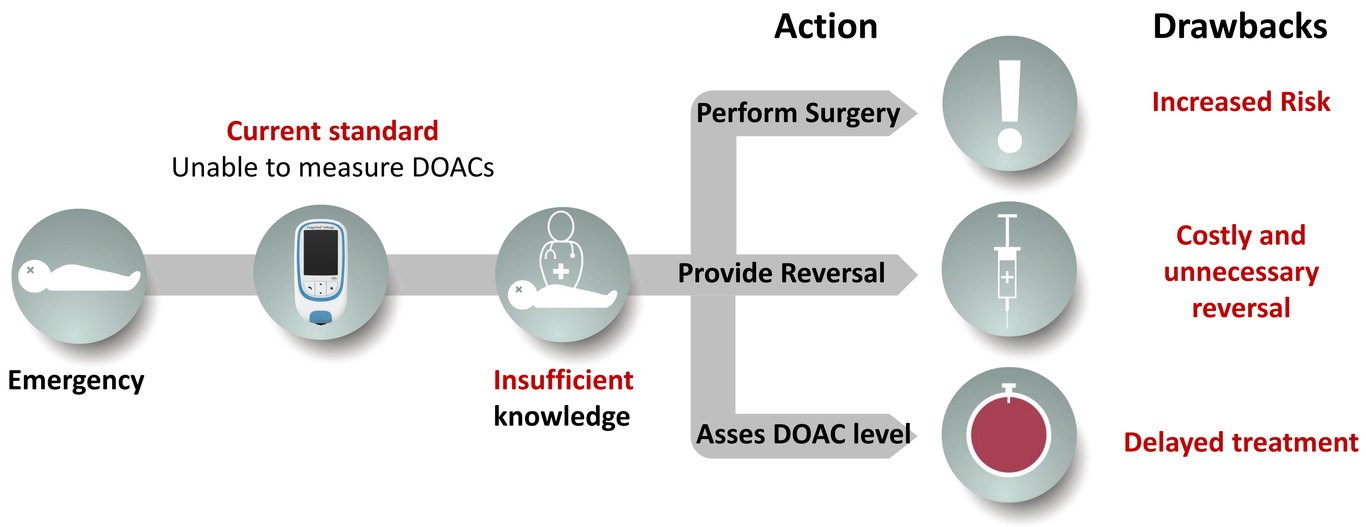
Medtech & Diagnostics

Enabling rapid lifesaving decisions for patients on anticoagulants in urgent care

MedicQuant
ADVANCING HEALTHCARE

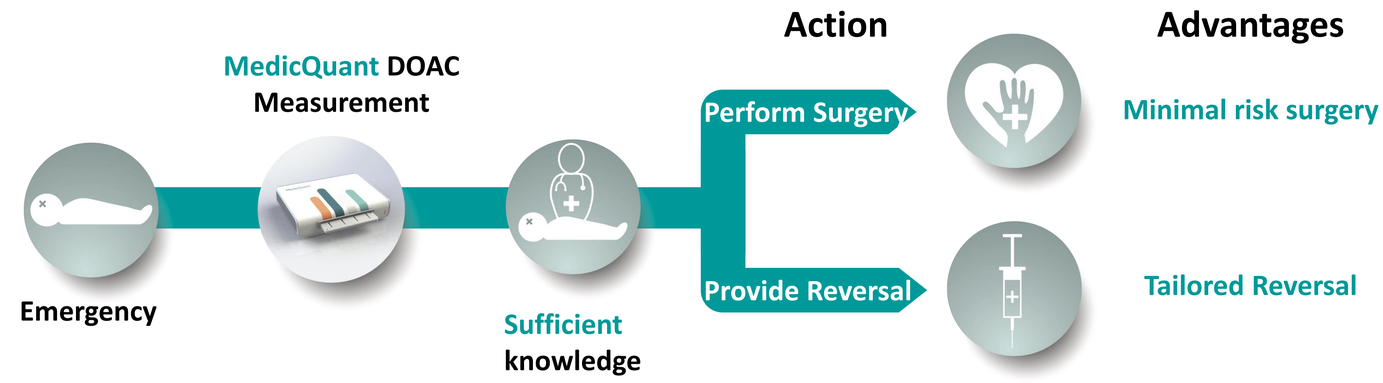
Problem

Anticoagulants are administered to prevent stroke, primarily in Atrial Fibrillation, affecting more than 6M people in the US alone. Rapid determination of the anticoagulant levels in patients in urgent care is important to decide if the patient can safely proceed to surgery or needs an expensive antidote. Currently there is no way to rapidly assess the drug levels of the new and commonly employed anticoagulant drug class DOACs. Only a centralized and time-consuming method is available only at specialized hospitals, thus patients are at risk.



Solution

We have developed a novel method that offers a rapid and local determination of the anticoagulant level in whole blood within 10 minutes. This test provides clinicians with sufficient knowledge for lifesaving management of patients when minutes matter. The solution complies with the newest guidelines for management of patients in major bleeds and trauma. A feat that our competitors cannot achieve, as seen below.



Competitors	Central Method	Current Standard	
Point of Care	✗	✓	✓
Quantitative	✓	✗	✓
Rapid <10 Min	✗	✓	✓
Suitable for DOACs	✓	✗	✓
Analysis Matrix	Plasma	Whole Blood, Plasma, or Urine	Whole Blood

Platform

The presented solution is a platform technology; thus the scope of application is not limited to anticoagulants. The technology has potential to expand into other fields of use where knowledge of small molecule levels is crucial.
We have proof of concept for antirheumatic and anticancer drug Methotrexate and the antibiotic drug Linezolid in addition to the two DOACs Dabigatran (Pradaxa) and Apixaban (Eliquis).

Technology Description

The technology behind MedicQuant is a novel immunoassay and a unique chip system developed by the researchers of the Gothelf lab. The immunoassay and the meticulously designed consumable chip technology allows for detection of drugs in complex media such as whole blood in less than 10 minutes. The assay is robust, and the chip technology enables ease of use with little to no training. The product is a dedicated reader and a disposable chip (one chip per analysis). We have tested the performance of the system in 3 different prototypes with similar performance, as well as tested batch to batch variance. The performance has been validated in saliva, milk, beer, and urine showing great robustness.

Intellectual Property Rights

The IP for the assay and chip system has been claimed in a priority application February 2019, EP appl. no. 19159127.0. A FtO analysis regarding the assay and chip system has been performed with a positive outcome.

The Team

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PhD
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Professor, PhD
Kurt V. Gothelf
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Julie W. Brogren
Strategic Advisor

Jens Peter Gøtze
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Advisors

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Current State

The device has been validated against the central method for measuring Dabigatran at Aarhus University Hospital, showing similar performance. The setup is currently being developed against other targets. The development of a scalable production method for the consumable and the assay is being pursued. Once the scalable method for all anticoagulants are at hand, a larger validation process will be initialized at the 4 major hospitals in Denmark.

Call to action

- **Funding opportunities**
- **Partnership and collaboration opportunities**

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Novel Diagnostics for Systemic Lupus Erythematosus

Medtech & Diagnostics

*N*anoscale *I*mmunoactive *P*rotein - *Q*uantification

Our goal: is to **create a diagnostic and prognostic tool** that will benefit patients suffering from **systemic lupus erythematosus (SLE)**. Our primary focus is **companion diagnostics.** This will **increase the value of new drug candidates** and focus existing treatment on patients with the best outcome.

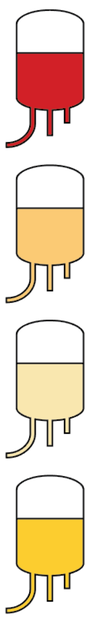
Liquid Biopsy

Whole Blood

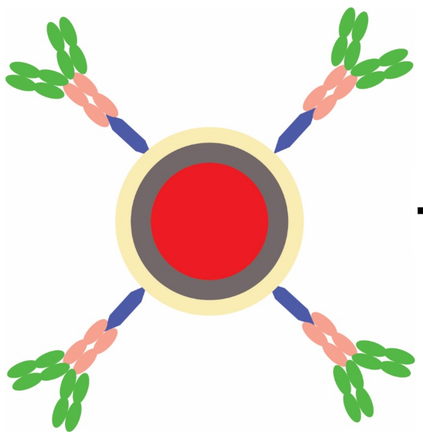
Blood Plasma

Synovial Fluid

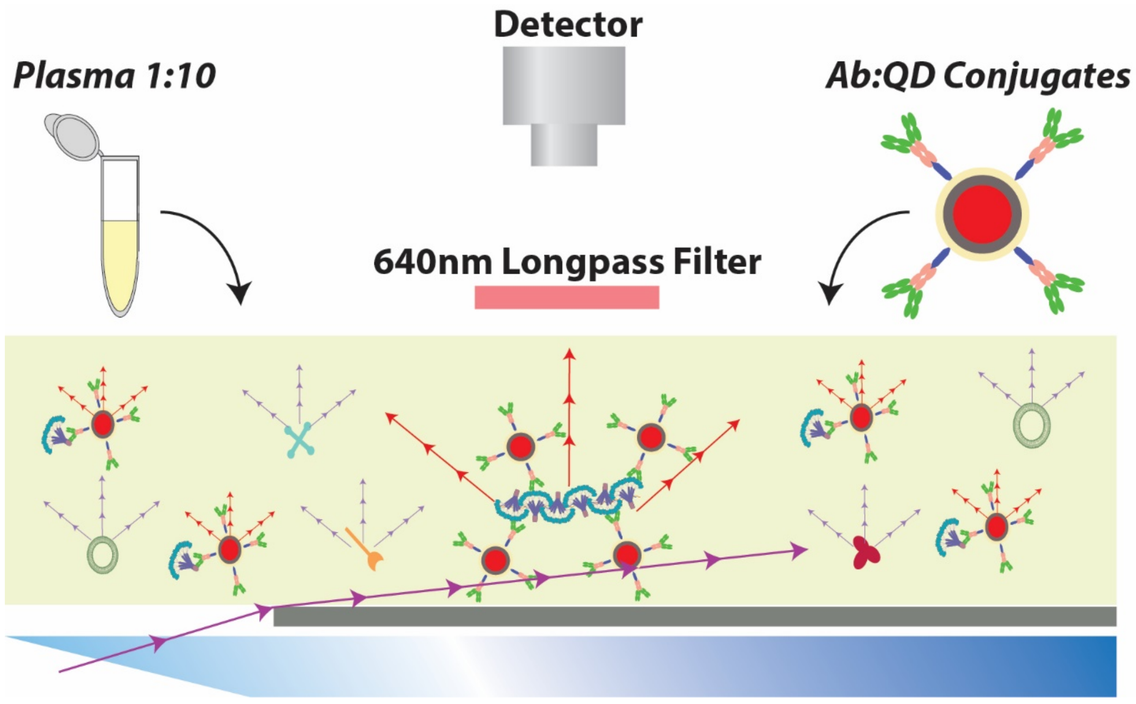
Urine



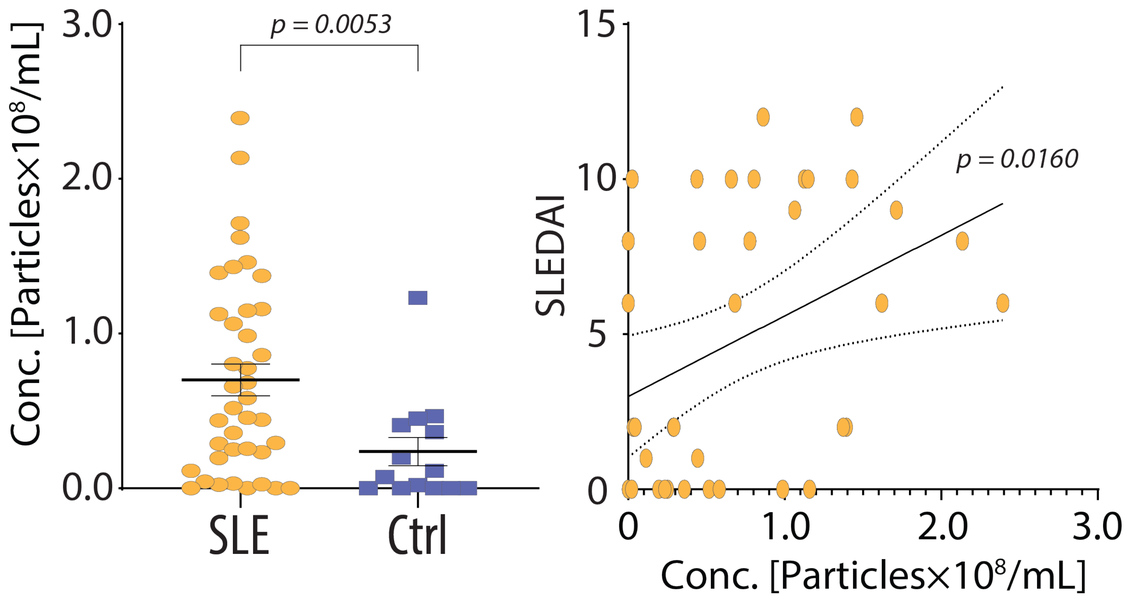
mAb Label



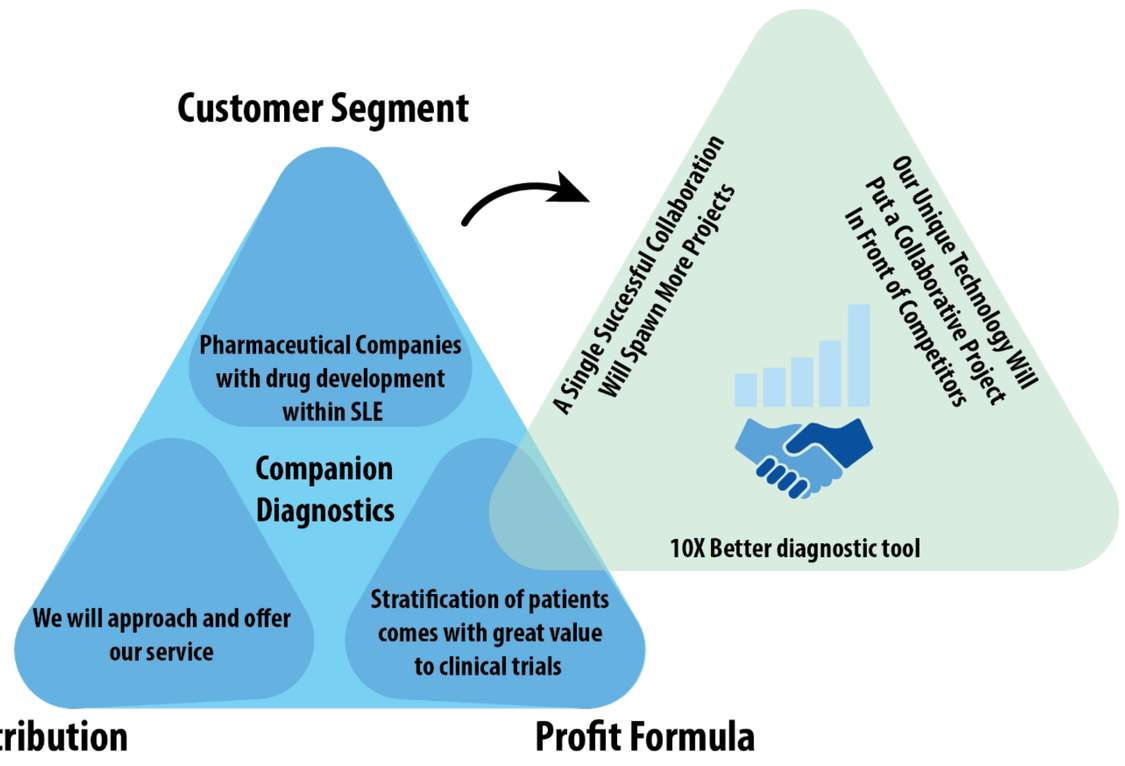
Nanoparticle Tracking Analysis



Strong Preliminary Data



Business Model



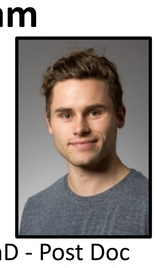
Technology Description

Our research team at Dept. of Biomedicine has identified Mannan Binding Lectin (MBL) as a superoligomeric protein upregulated in patients with SLE. The size distribution of **large MBL particles are increased in patients with SLE**. We see a large spread among patients reflecting the heterogeneity of the patients and the need for sub classification. The concentration of **these large complexes are also correlated with the disease activity** of the patients reflected by the SLE disease activity index (SLEDAI) score.
This correlation between a biochemistry biomarker and SLEDAI is novel within SLE diagnosis and opens the possibility of using this technology for prognostic purposes.

Intellectual Property Rights

We have submitted (Nov. 2019) a patent for application of NIP-Q in SLE. **We will investigate the possibility of strengthening or IP with additional data** and correlations with clinical and biochemical data of the patients. **Our main focus is SLE, but we have shown, that NIP-Q has great applicability in diseases involving superoligomeric proteins**. Therefore, we are watchful of new potential IP that needs protection.

Team



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MD DMSc - Professor
Holger Jon Møller
Scientific Advisory Board

DMSc PhD - Professor
Thomas Vorup-Jensen
Chief Executive Officer

MD DMSc - Professor
Bent Winding Deleuran
Scientific Advisory Board

PhD - Senior Advisor
Niels Skjærbæk
External Business Development

Current State

Following **completion of Proof-of-Concept**, we plan to continue NIP-Q development via soft funding. This phase would allow us to **work towards a more direct application of NIP-Q in a commercial setting and develop a full business case for a future biotech spin-out**.

Business opportunity and Call to action

We seek partnering opportunities with stakeholders within SLE treatment and diagnostics. This will allow us to continue development of NIP-Q technology towards a specific clinical need.

Furthermore, we seek investors that can help facilitate the establishment of NIP-Q as an independent biotech start-up company.

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Inventions from Danish Research Institutions

AARHUS UNIVERSITY

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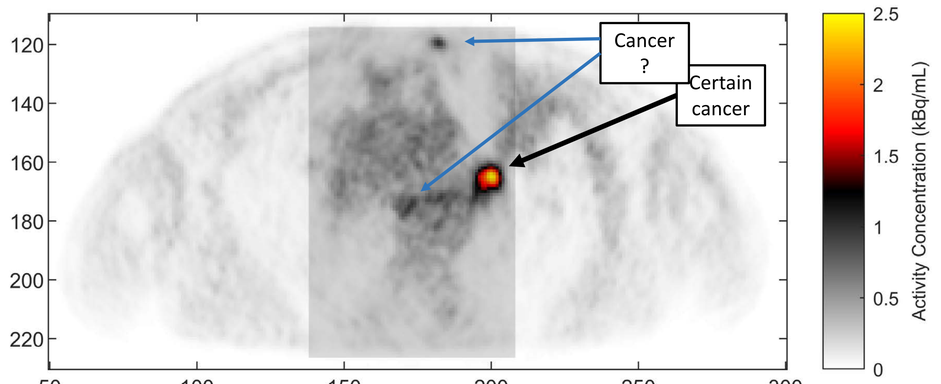
ProPET

Probabilistc PET image analysis

Medtech & Diagnostics

The value and challenge with PET imaging

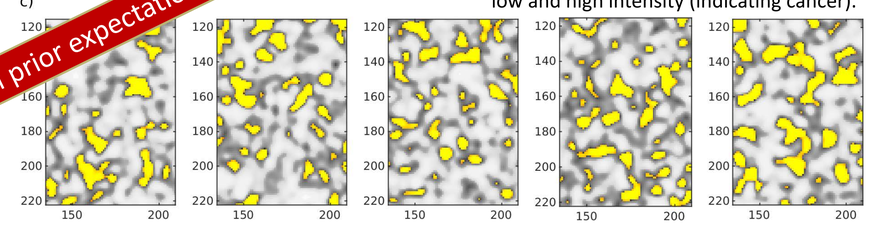
PET imaging visualizes in-situ radioactive intensity, and is used to identify high intensity cancer lesions. But, a PET image is a **smoothed** and **noisy** representation of the real intensity.
It is *non-trivial to identify smaller cancer lesions*.



ProPET combines a statistical description of
a) a medical experts expectation (a prior model),
b) the noise and smoothing (physics) of the PET scanner and reconstruction method used,
and produces a collection of sharp images (the posterior model) of the in-situ tracer intensity, than allow **quantitative PET image analysis**.

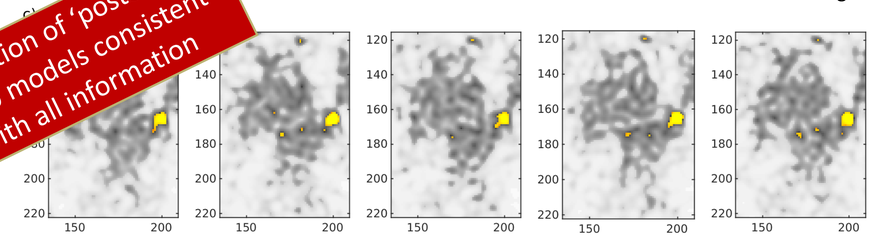
Medical prior expectation

A visualization of 5 models of 'expected' tracer intensity. Notice the assumption of a sharp boundary between low and high intensity (indicating cancer).



Collection of 'posterior' sharp models consistent with all information

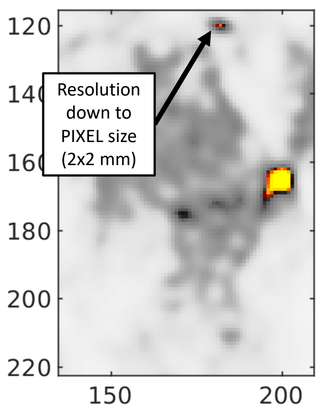
A visualization of 5 models (of many more) all consistent with all available information. The probability of a certain feature (such as cancer) is proportional to the frequency with which it occurs in the images!



ProPET is fundamentally different to other methods on the market and allows: **Better resolution, automatic segmentation**, and **quantitative analysis of the size and intensity of cancer lesions.**

The can lead to better treatment and less mortality.

Image enhancement



ProPET produces an enhanced PET image with **less noise** and **higher resolution.**

This allows **<u>identification</u> of small cancer** lesions, **at an earlier time** than possible today, leading to higher probability of recovery

Image segmentation

ProPET allows **semi-automatic image segmentation, and**

Quantification of **probability of locating cancer** lesions.

ProPET is a quantitive tool that assist a medical expert taking decisions!

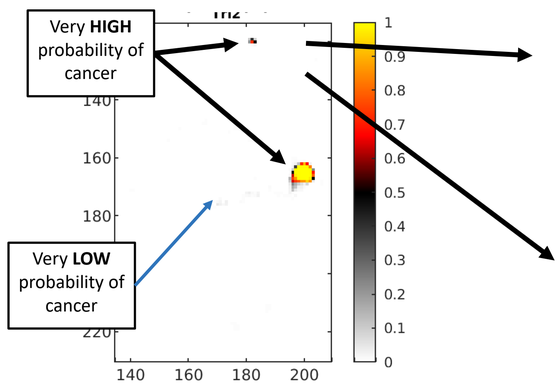
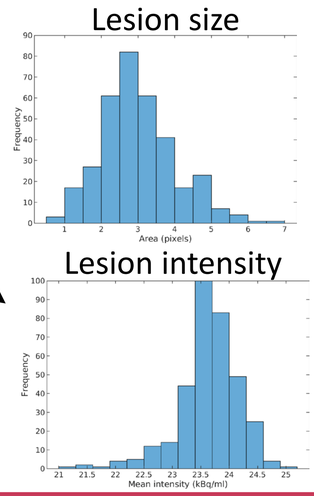


Image analysis



ProPET allows quantifying the **size** and **intensity** ofidentified high intensity lesions.

These two measures are **crucial in <u>designing the proper treatment</u>** of cancer and **evaluation of ongoing treatment of cancer**.

Technology Description

Most methods for PET image enhancement has the goal of providing one optimal PET image, often leading to artefacts, and addressing the associated uncertainty is non-trivial.
ProPET develops a fundamentally new approach to PET imaging that allow taking medical expert information into account when performing PET image analysis. Uncertainty and risk assessment is a natural outcome of ProPET.

ProPET is a new quantitative approach to PET image analysis unlike any other on the market!

Intellectual Property Rights

Patent: WO 2018/215357 DEVICE AND METHOD FOR PET IMAGE RECONSTRUCTION

The patent is in the national phase in Europe and USA. It is owned by University of Copenhagen and ProPET has an exclusive license to exploit the patent. ProPET has the rights to re-sell these exclusive rights.

Team

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Thomas Mejer Hansen

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Current State

We have a working protoype for ProPET Image Enhancement ready to applied on a broader scale.
The method has been applied in cooperation with scanning and medical experts from Rigshospitalet.
The next step is to perform a **market analysis** (beginning with the Danish market), and explore the application of ProPET at Danish hospitals using PET imaging,

Business opportunity and Call to action

The market for PET scanning is large. More than 2 million PET scans is performed each year in the US alone. ProPET allow utilizing medical expert information, in a way that no other methodology currently allows.
We seek funding, and professional partnerships, to allow scaling and developing the ProPET methodology and to support and develop ProPET as a company, with the goal of selling its services worldwide.

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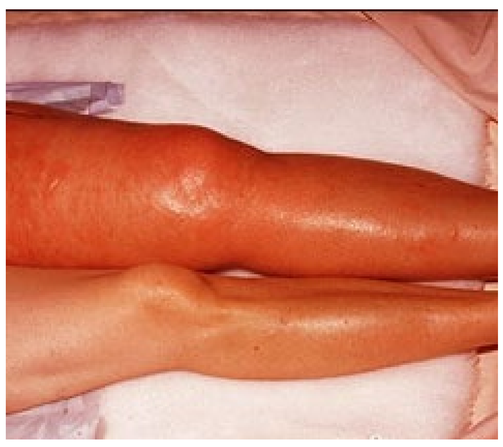
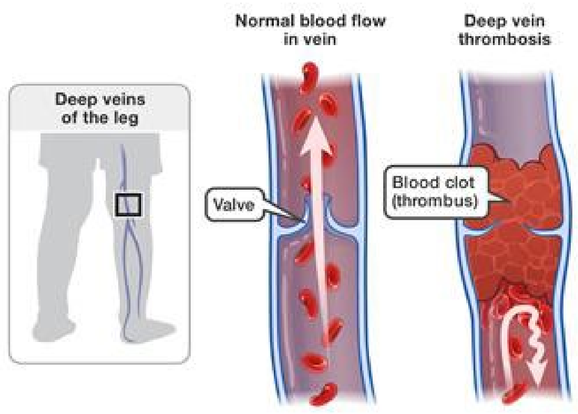
AARHUS UNIVERSITY

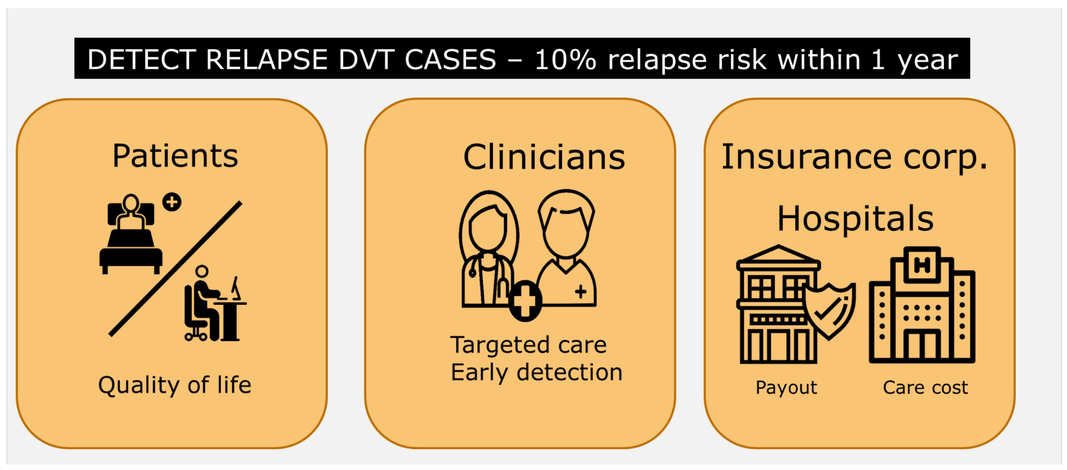
Smart-sock for monitoring deep-vein-thrombosis

Medtech & Diagnostics

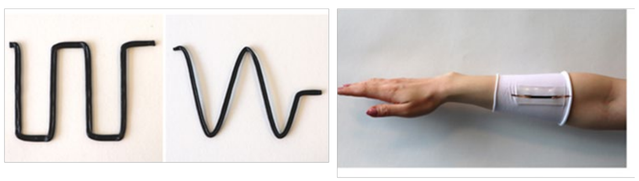
Deep vein thrombosis (DVT) – "Blodprop i benene":
Blood cloths / DVT develop over days and weeks, mainly due to heart conditions, hospitalization and post-surgery.



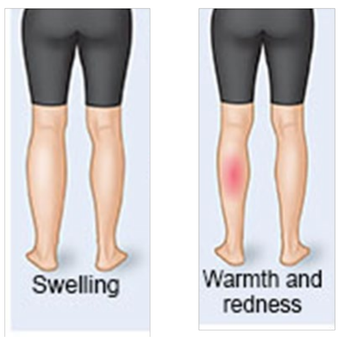


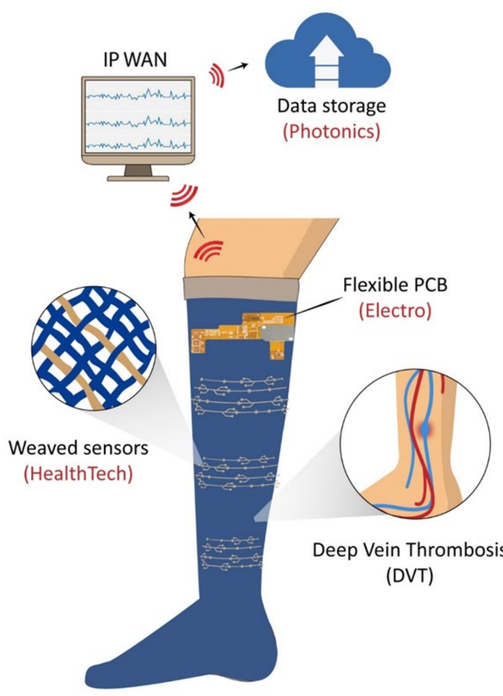


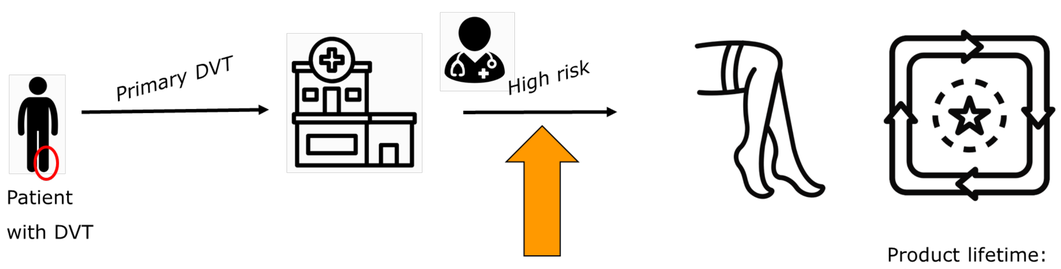
3D printed stretchable sensor on fabric

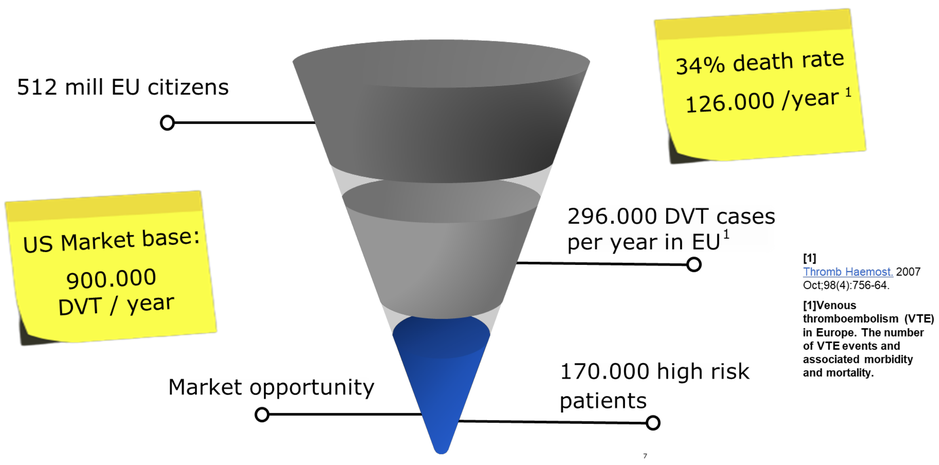


Sensor for Monitoring the Swelling and Temperature









Technology Description

The sensor:
- High sensitivity (GF=3)
- Self-healable
- Highly durable
- Green and recyclable

The communication framework:
- Low-power (LP-WAN)
- Long reach
- Stand-alone and embedded
- Secure and reliable
- User-friendly backend system

Intellectual Property Rights

File No. EP19212902.1

"A highly stretchable, self-healable, adhesive, conductive and moldable supramolecular polymer composites for healthcare applications"

Team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Tiberiu Gabriel Zsurzsan


Martin Nordal Petersen


Alireza Dolatshahi-Pirouz


Stanley Ch. Nwabuona

Current State

The SmartSock is currently in the prototype phase.
The team is evaluating different printing and weaving methods for incorporating the sensor into garments. LP-WAN technologies and flexprint integration techniques are benchmarked.
Future plans include lab tests and tests with patients in collaboration with hospitals in Denmark.

Business opportunity and Call to action

The team aims at creating a spin-out company that will mature and commercialise the technology.
We are looking for:
- investors to help to further mature the prototype into the next stage
- industrial partners to mature the product with expertise in medical certification
- additional patient cohorts for clinical phase trials

DANISH IP FAIR
Inventions from Danish Research Institutions

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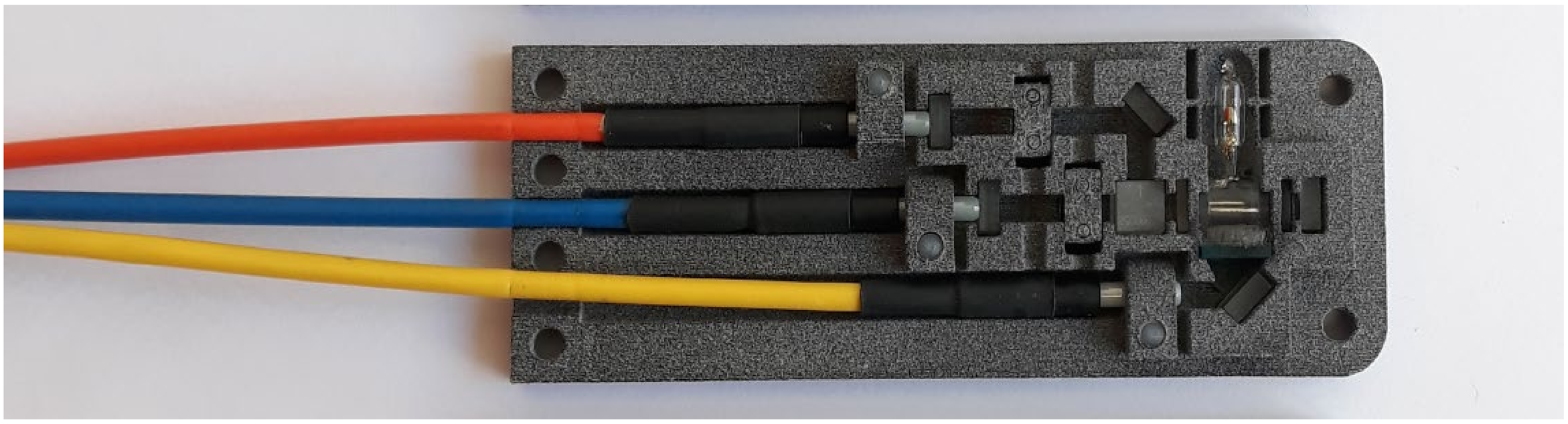
Optical Magnetometry for MRI Image Improvement

For Diagnostics and Research

Medtech & Diagnostics



A magnetic field can now be monitored continuously during MRI scans - without any form of interference - since the probe comprises 100 % nonmetallic components.

With high quality temporal data on the magnetic field evolution during an MRI scan, the image can be corrected to be sharper and artefacts can be removed.

This capability finds applications both in MRI research and in general diagnostics.

Technology Description

The device is based on atomic spectroscopy of cesium with resonant laser light. A 3D printed nylon probe contains the atomic vapor cell and the optics necessary to perform precision spectroscopy. The probe is fiber connected so that lasers and electronics can be located remotely from the MRI scanner.

The probe dimensions are 90x33x10 mm3. Several probes can be powered by the same laser, and work is ongoing towards developing a system with four probes for in-situ field monitoring at four separate points in the magnetic field. A signal bandwidth of tens of kilohertz and a resolution of microTeslas has already achieved and can be optimized further. The current system was developed for measurements at 7 Tesla +/- 10 mT, but is easily reconfigured to work at other field strengths above 1 T.

Intellectual Property Rights

A patent application has been filed with the Danish authorities with a priority date of December 14th, 2018, and is now in the PCT phase.

Team

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NBI/DRCMR

Research Fellow
Vincent Boer
DRCMR

Senior Researcher
Esben Thade Petersen
DRCMR

Assistant Professor
Kasper Jensen
University of Nottingham

Professor
Eugene Polzik
NBI

Current State

A prototype with a single probe has already been developed. While expanding the system to four probes, we are working on improving the sensitivity with a view to performing a demonstration of image improvement in MRI during the next 12 months.

Business opportunity and Call to action

We are looking to make first contact with interested parties and discuss future potential collaborations and partnerships.

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Inventions from Danish Research Institutions

UNIVERSITY OF COPENHAGEN

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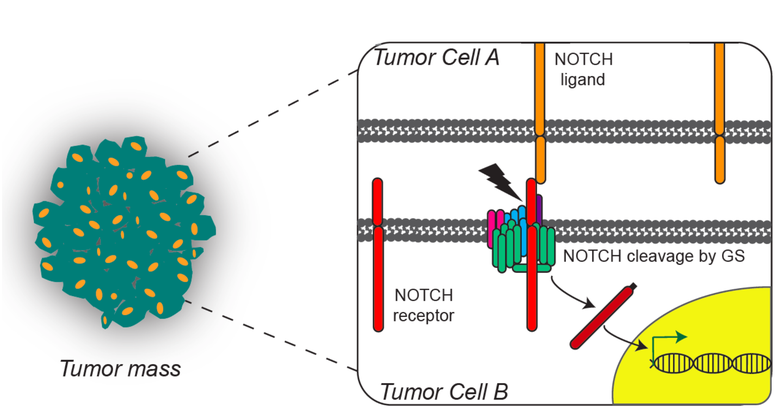
Predicting gamma-secretase inhibitor (GSi) responders pan-cancer

Medtech & Diagnostics

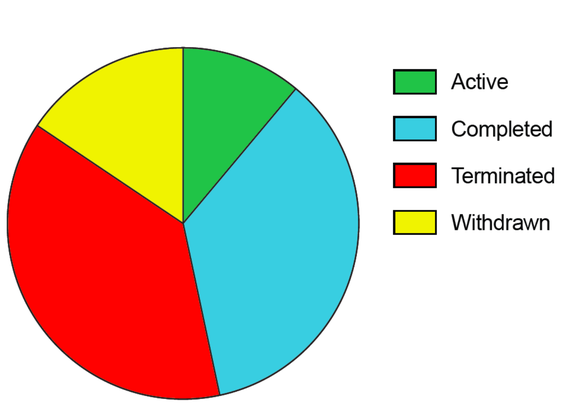
A pan-cancer gene expression panel which can predict cancer patient sensitivity to multiple types of GSi compounds

The Challenge

- Oncogenic NOTCH pathway activation occurs in many cancer types, driving aggressive tumor behavior and poor patient outcome

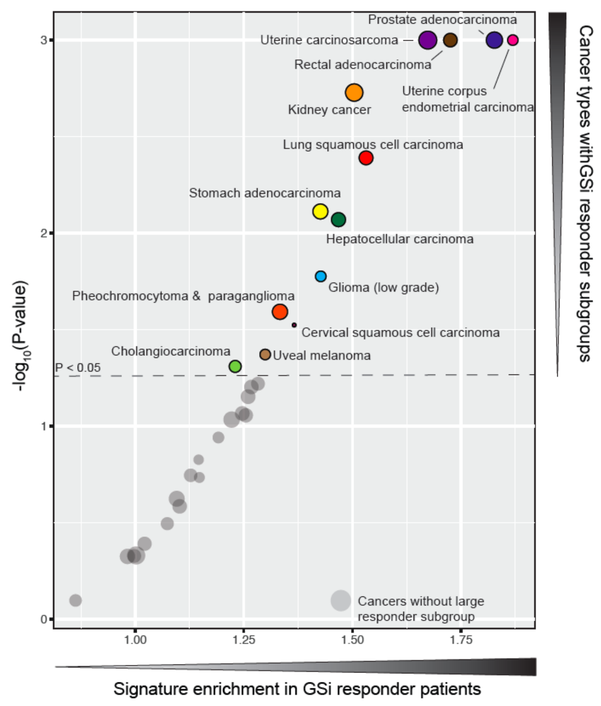


- NOTCH signaling can be inhibited by gamma-secretase inhibitors (GSi) but clinical trial termination rates are very high due to off-target toxicities in a subgroup of patients. Robust molecular tools to enable responder patient selection for inclusion in GSi trials are needed

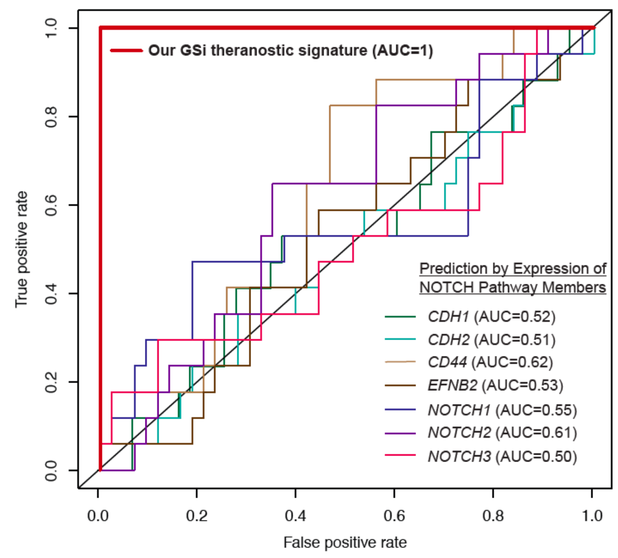


The Solution

- Our GSi sensitivity signature predicts large patient responder subgroups across multiple cancer types

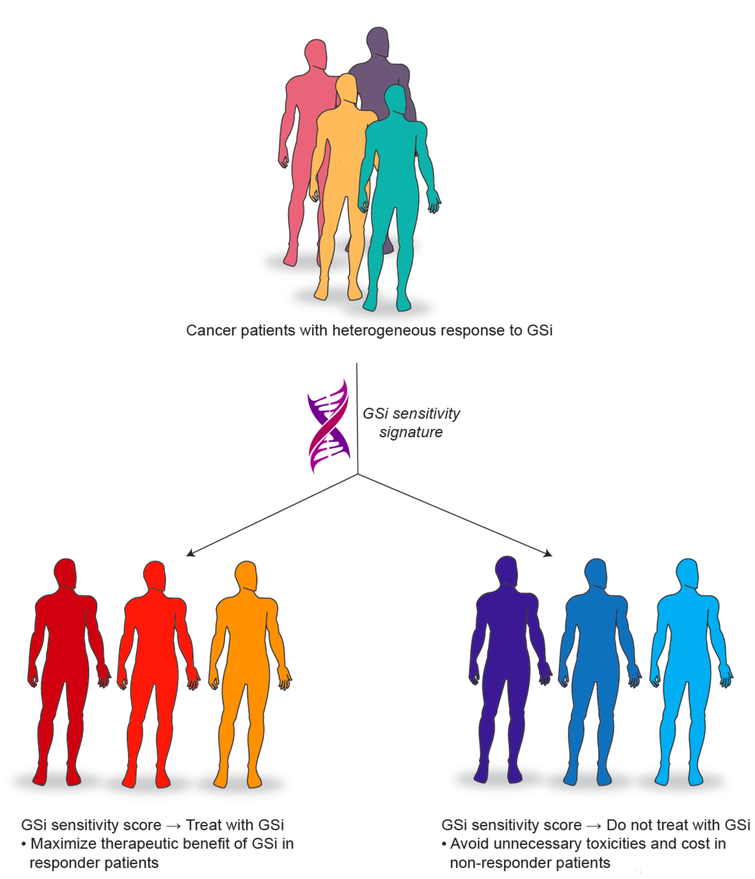


- Our GSi sensitivity signature significantly outperforms measurements of target pathway expression in classifying sensitivity of cell lines to these drugs



The Impact

- Our GSi sensitivity signature can be exploited to select high-confidence responder patients for treatment with GSi



- **clinical development tool for GSi**
- **specific theranostic tool for personalised treatment strategies**

Technology Description

Initially developed through analysis of bile duct cancers (O'Rourke et al. Hepatology 2020), we identified a transcriptomic signature capable of identifying GSi-sensitive versus GSi-resistant tumors.

By evaluating our GSi sensitivity signature pan-cancer (31 cancers, 9409 tumors), we predicted 41.9% of cancers to have large prospective responder subgroups (32.6% - 59.6% patients within a given cancer type) who many benefit from treatment with GSi.

In GSi-treatment screening of 60 diverse solid cancer cell lines, our 20-gene signature could discriminate nanomolar from micromolar sensitivity to GSi treatment with an AUC of 1, significantly outperforming the predictive capacity of measuring levels of individual NOTCH signalling genes.

Team

Jesper B. Andersen, PhD
Associate Professor

Colm J. O'Rourke, PhD
Assistant Professor

Dan Høgdall MD PhD
Oncologist

Intellectual Property Rights

PCT application PCT/EP2020/059091 was filed 1st April 2020
Inventors (Dr. Jesper B. Andersen, Dr. Colm J. O'Rourke, Biotech Research and Innovation Centre,) Assignee; University of Copenhagen)
- method claims and kits/product
- European Search report positive for claims claiming use of three or more genes of panel

Current State

Theranostic assay has shown predictive potential independent of solid cancer type, NOTCH mutational status and specific GSi compound (RO4929097, YO-01027, Z-LLNle-CHO). Signature has been optimized across diverse models (*in vitro*, *in vivo*, *ex vivo*) and technologies (gene expression array, RNA sequencing).

Next steps Validation of panel in small group of GSI-treated late stage cancer patients currently; and Development of a signature-specific assay.

Business opportunity and Call to action

We are looking for a potential licensee.

DANISH IP FAIR
Inventions from Danish Research Institutions

UNIVERSITY OF COPENHAGEN

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Sonohaler

– Control your asthma by sound

Medtech & Diagnostics

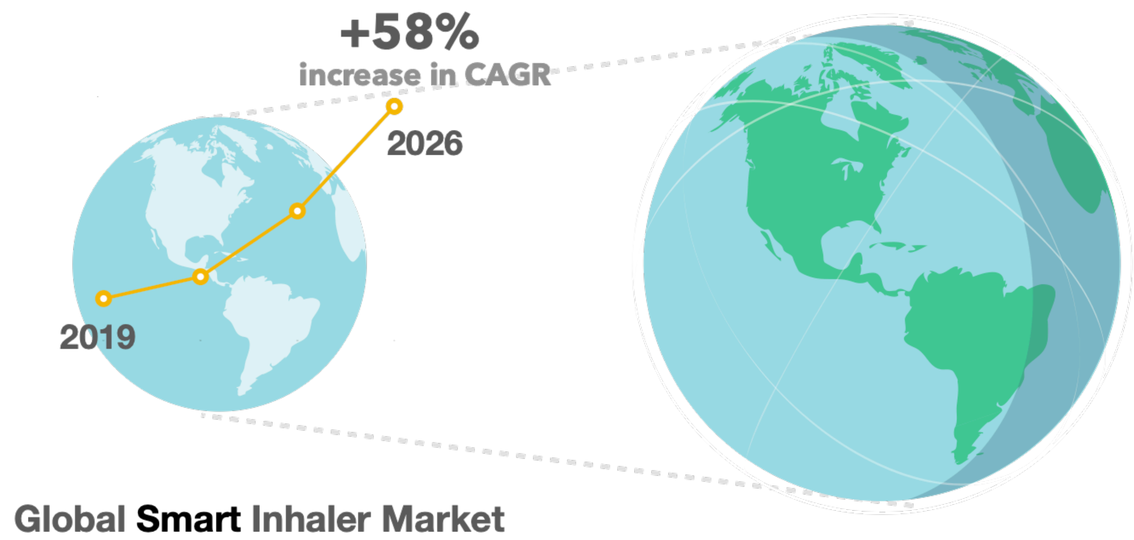
Sonohaler's affordable Smart inhalers help asthma patients live active healthy lives

Asthma accounts in America for

- 21 billion dollars in asthma care every year
- 1.7 million visits to the emergancy room every year
- 10 deaths occur every day

70% of all patients take their medication wrongly

- Inhaler technique is difficult
- Many patients forget medicating and forego compliance
- Especially parents worry if their asthmatic child has gotten the complete medication dosage



Global **Smart** Inhaler Market

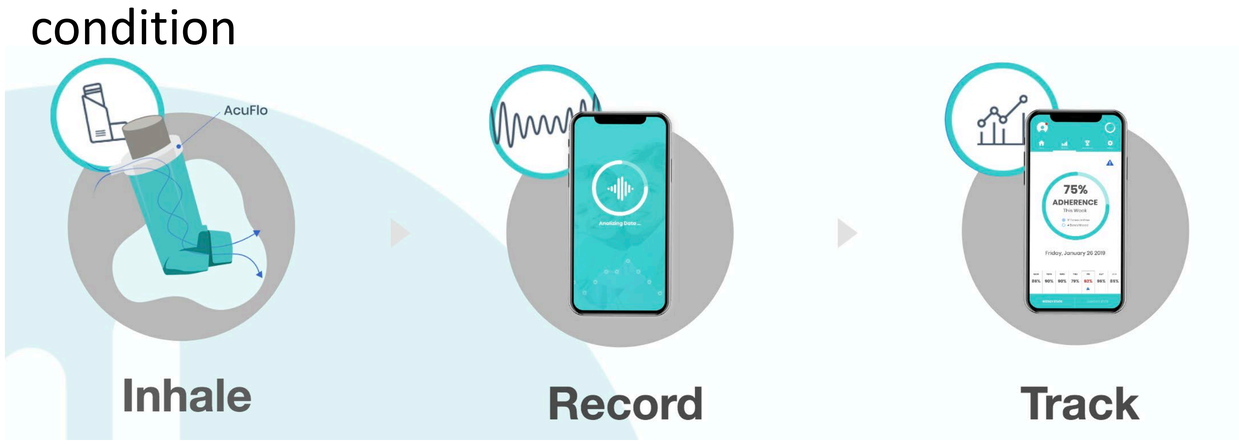
$ 34 M (2018)

$ 1.4 B (2026)

Global **Asthma** Inhaler Market

$ 41 B (2018)

AcuFlo product App analyses sound from its non-tech device, giving users important insight into their lung condition



- Ensure correct dosing with every inhalation
- Easily track inhaler usage and share with physician
- Follow lung health and understand asthma attacks

The AcuFlo product matches the features of competitors but at a fraction of the price

Provider	Inhaler Technique Assessment	App	Lung Performance	Predictive Analysis	Bluetooth	Annually
sonohaler	✔	✔	✔	✔	✘	$36 / $48
CapMedic	✔	✔	✔	✘	✔	$99.99
hailie	✘	✔	✘	✔	✔	$159
findair	✘	✔	✘	✔	✔	$89
Propeller	✘	✔	✘	✔	✔	Not known/ Est. unit cost $300

Technology Description

The AcuFlo product device can be used alone or designed to fit a specific inhaler. The device is an advanced whistle that produces a sound during inhaler intake. The sound generated is captured and analyzed by a mobile app to assess inhalation technique and lung function.

The technology enables monitoring of inhalation and drug dosing providing valuable information about the users lung health and asthma treatment, to improve their individual treatment for better respiratory health. The app is particularly tailored for parents of children with asthma to follow their child's asthma treatment.

Intellectual Property Rights

Title: Inhaler with acoustic flow monitoring
Application no.: PA 2017 70492
Filing date: 23 June 2017
Owner: University of Copenhagen
Exclusive Licensee: Sonohaler

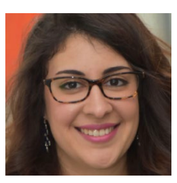
Team


Adam Bohr
CEO


Khanhvi Tran
CTO


Ash Pradhan
COO


Søren Jensen
Analytics Lead


Yasmine Iacone
Regulatory Lead


Nicholas Kamp
Finance Controller

Current State

- 1st generation product is being tested and optimised in readiness for clinical and usability trials scheduled to be held in USA/Canada in November 2020.
- Soon to be filing applications for FDA 510k and Canadian regulatory approval
- Digital marketing strategy and execution plan is being finalised

Business opportunity and Call to action

Sonohaler is seeking funding between USD 500k and 1 Million to undertake activities such as clinical and usability trials, obtain FDA 510k and Canadian approval, and expand commercial operations towards being market ready for product launch in June 2021.

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Inventions from Danish Research Institutions

UNIVERSITY OF COPENHAGEN

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Device for Holding Mini-Enema

Medtech & Diagnostics

Simple solution for subjects with reduced hand function to self-administer a mini-enema

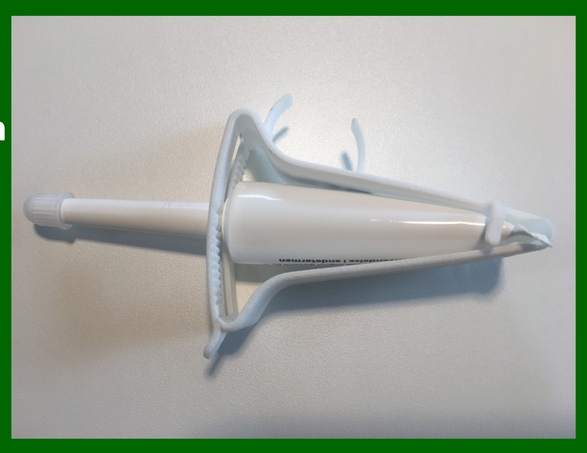
Constipation - A huge global market

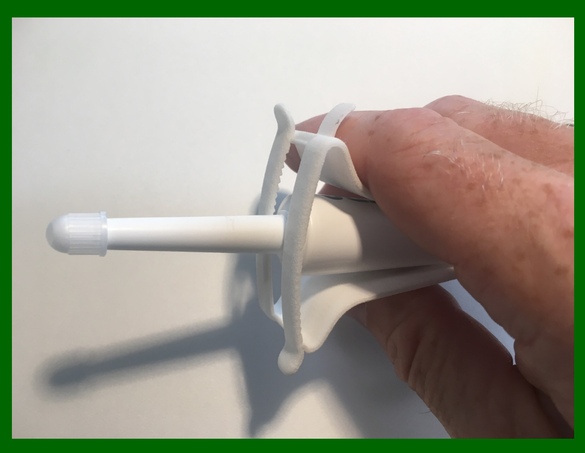
- The prevalence of constipation is 2-30% in the general population but more than 50% in the elderly
- High prevalence of constipation in subjects with spinal cord injuries
- The mini-enema is for many subjects the over-the counter (OTC) treatment of choice for softening the stool and assisting bowel movements
- OTC sales of enemas is 13 mill units (value 38 mill US$) in 2017 in the US

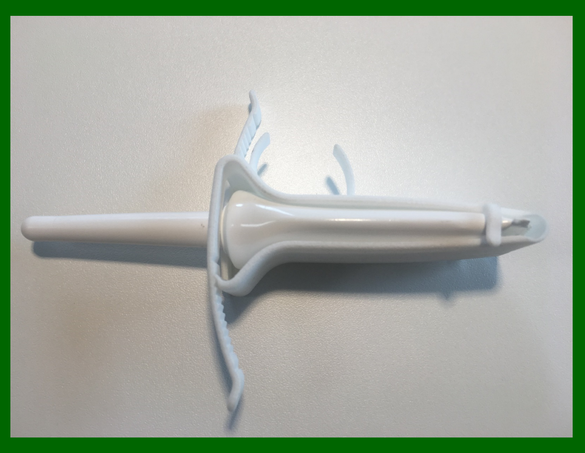
Problem – Treatment of constipation in subjects with reduced hand function

Many subjects may have a need for using a mini-enema for treating their constipation – but may require assistance with this procedure because they have difficulties holding, managing and emptying the mini-enema tube due to:

- Spinal cord injury
- Brain injury
- Sensory disturbances
- Reduced muscle strength
- Reduced motility
- Reduced coordination







Solution – Mini-enema device

The device can be used for fixing and holding the mini-enema and thus enabling people with reduced hand function to maneuver the tube without risk of dropping and thus being able to self-administer an enema.
The gripping arms of the device will lock during emptying and thus keep pressure on the tube. This will both fix the device to the hand and keeping pressure on the tube while preventing back-flow. This will enable users with limited strength in their hands to take a brief pause without losing grip or pressure on the tube.
The device may be used with various marketed mini-enema tubes. Successfully tested and used by subjects with spinal cord injuries.

Quality of life – Preservation of dignity and flexibility

It is important for most people to be as independent of care as possible. When a person can manage the administration of the enema him-/herself, then both the user and health professional save time.
Most importantly - people can preserve their dignity by doing this intimate procedure themselves.

Technology Description

The mini-enema device is designed to hold the enema tube and then fix the device to a finger or the hand so that the enema. The thumb can then be used to put pressure on the tube to empty it. Gripping arms on the device locking on another part of the device will hold the pressure on the tube during emptying. The subject may thus have a good grip of the tube and still be able to empty the contents of the tube.

Intellectual Property Rights

We have filed a PCT patent application (PCT/EP2019/073342) in September 2019 describing the technology. The patent application has been published. The IPR is owned by Rigshospitalet.

Team

Inge Steen Pedersen
Occupational therapist
Department of Spinal Cord Injuries
Rigshospitalet

Current State

We have developed different functional prototypes which have been tested - and are currently used - by subjects with spinal cord injury. The prototypes have received a very positive feedback from users.

Further development work is ongoing in refining functionality.

Business opportunity and Call to action

We wish to find collaborators or companies who are interested in continued development of the product.
Ultimately we would like to attract a licensee which will be able to produce, market and sell the device.

DANISH IP FAIR
Inventions from Danish Research Institutions

REGION H Rigshospitalet

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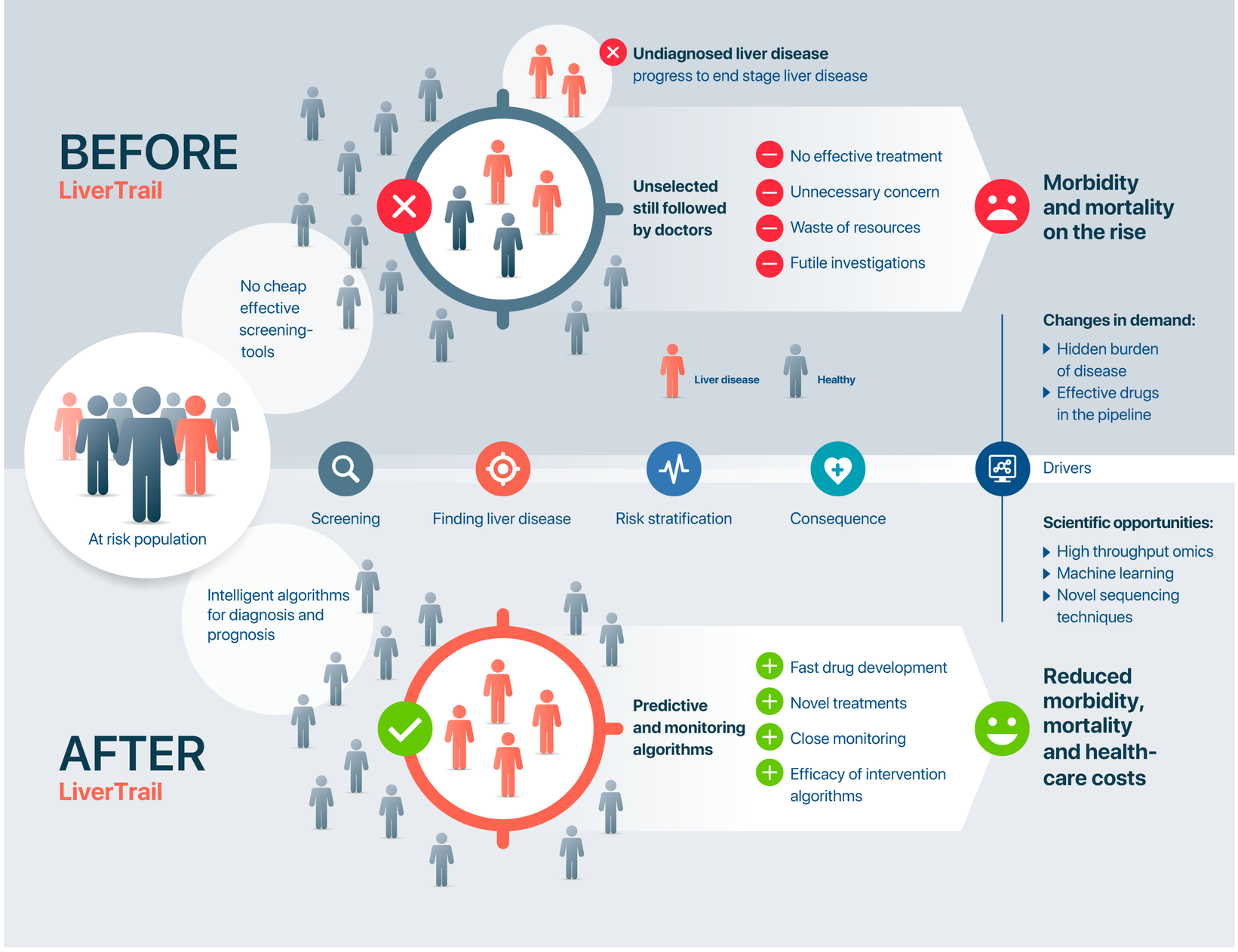
LiverTrail

Medtech & Diagnostics

To diagnose chronic liver disease earlier
To use healthcare resources smarter

*We will introduce **LiverTrail**, a software that tie into existing IT infrastructure of healthcare systems and provides a cheap, fast and accurate diagnosis of liver disease*



Technology Description

High quality heterogeneous scientific data from 5.000 patients will generate the basis for advanced diagnostic algorithms. We have developed the first version of LiverTrail, which contains 197 algorithms based on combinations of age and nine routine blood tests. Currently we are working on further development and validation of app algorithms, and collecting further data for software proof-of-concept (end-date 2022) and for the development of the intelligent pattern recognition through machine learning in version 2.0.

Intellectual Property Rights

The invention of LiverTrail has been reported by the inventor to the TTO authorities at the University of Southern Denmark

- LiverTrail qualifies as an in vitro diagnostic medical device, as defined in Article 1.2(b) of Directive 98/79/E
- EU CE marking

Professor Aleksander Krag MD, Ph.D.

Future: advisory board

Ass. Professor Maja Thiele MD, Ph.D.

Future: advisory board

Ph.D. student Katrine Lindvig MD

Future: CEO

Current State

We have a Minimal Viable Product with a strong academic background. We have etablished collaboration with the Department of Biochemestry in the Region of Southern Denmark.

Business opportunity and Call to action

We seek public-private partnerships to further mature LiverTrail. Investment and collaboration on implementation and business development.

DANISH IP FAIR
Inventions from Danish Research Institutions

Region Syddanmark

SDU

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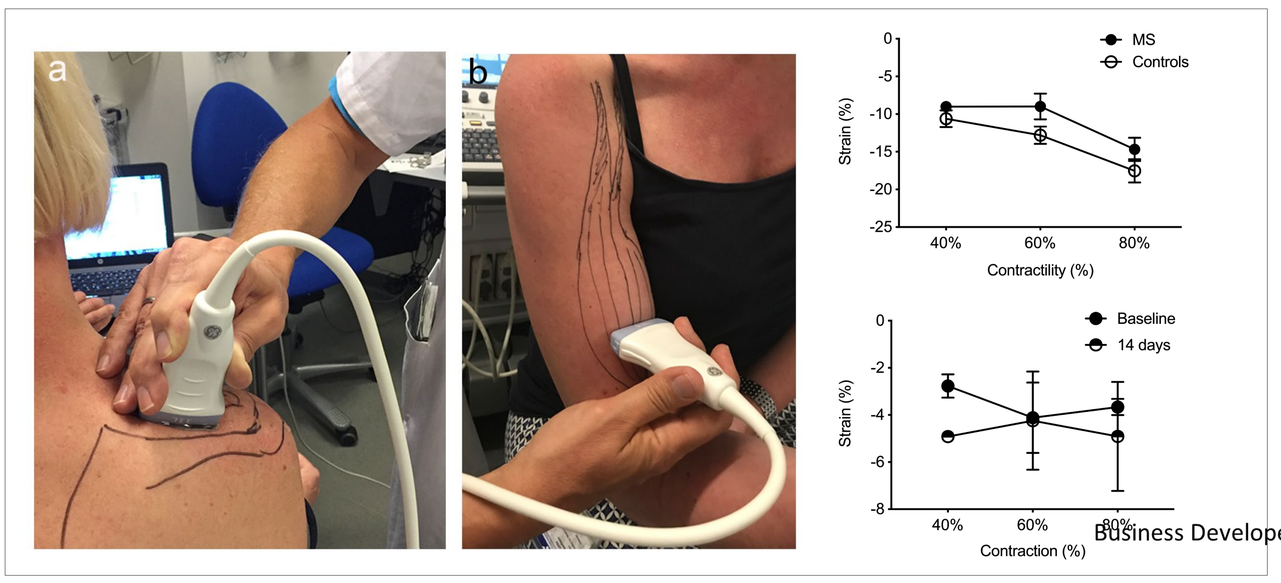
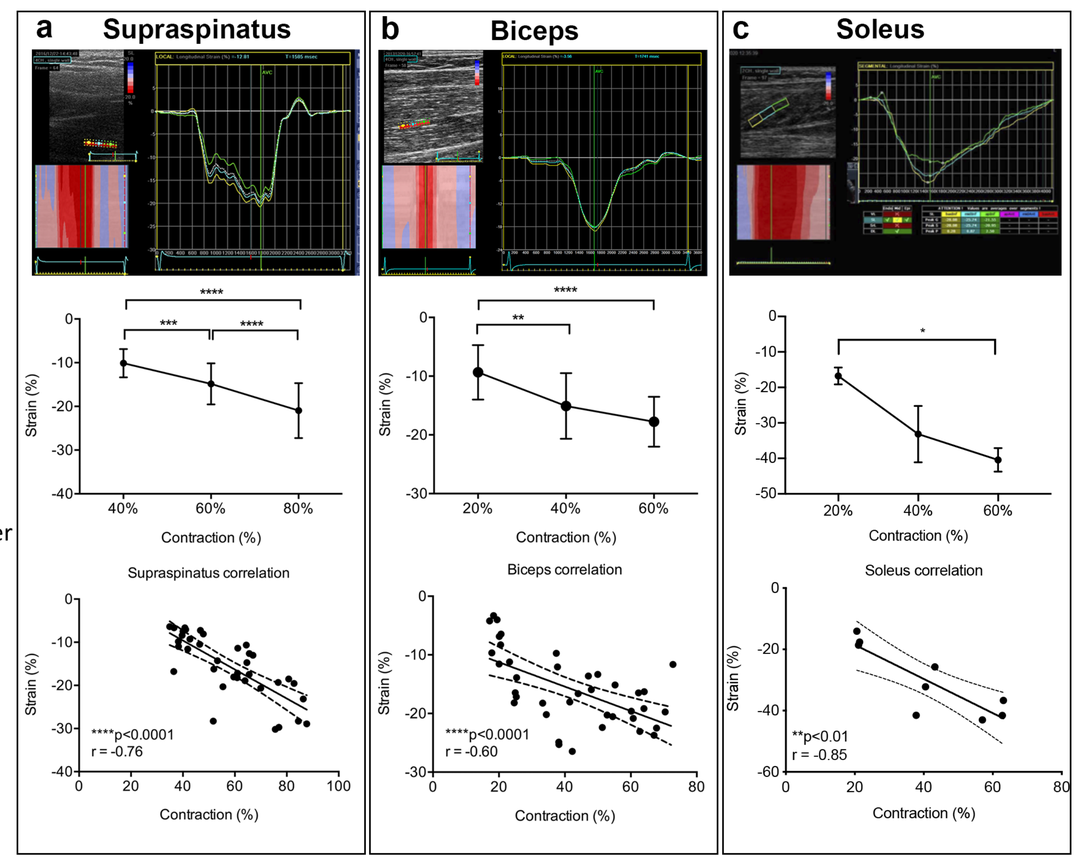
Direct Isometric Muscle Strain Analyses using Speckle Tracking Ultrasound Technology

Medtech & Diagnostics

Value proposition

- 2D speckle tracking ultrasound (STU) allows ***non-invasive tracking*** of the deformation of muscle fibres within skeletal muscles.
- The perspective is that STU can be used in daily clinical practice to track muscle function (i.e. muscle contractility), to monitor rehabilitation of any muscular damage, improvements of muscle recovery following cerebral injury, treatment responses of neuromuscular disease, in addition to muscle fatigue and sarcopenia/aging.





- Reduced or abnormal strain patterns are observed in multiple sclerosis (MS) patients.
- Strain can, however, be improved following medical treatment.
- In healthy controls, strain patterns are linearly associated with increasing external loads.

Technology Description

Muscle strain is the result of tension-generating sites within muscle fibers acting cumulatively to generate contraction. Currently, few in vivo imaging techniques are able to characterize muscle strain. Strain analysis is currently being embraced and increasingly adopted in many echocardiography laboratories worldwide.
We have applied the speckle tracking technology to measure individual skeletal muscle function expressed as contractility capacity. Results of this non-invasive in-vivo examination of muscles gave promising results as shown in the figure a, b and c.

Intellectual Property Rights

Patent pending:
Publication: **US** 2020/0000433 A1, **EP** 3576607A1, ULTRASONOGRAPHIC METHOD FOR MEASURING MUSCLE DEFORMATION.
All patent rights are held by
The Region of Southern Denmark & The University of Southern Denmark.

Team


Clinical Associate Professor
Lars Henrik Frich
University of Southern Denmark
& Odense University Hospital


Associate Professor
Anders Holsgaard-Larsen
University of Southern Denmark
& Odense University Hospital


Professor
Kate Lykke Lambertsen
University of Southern Denmark
& Odense University Hospital

Senior Consultant
Jordi Sanchez Dahl
Odense University Hospital

Senior Consultant
John Hjarbæk
Odense University Hospital

Current State

TRL 4.
The lab test have used GE Ultrasonic Equipment for speckle tracking of the heart. The technology is ready to be implemented in ultrasonic equipment for speckle tracking designed for skeletal muscles. The research team is open to assist in developing the speckle tracking for skeletal muscles needed if not already available.

Business opportunity and Call to action

Collaboration on building prototypes including developing dedicated ultrasonic equipment for speckle tracking of skeletal muscles.
Research collaboration to utilize the technology further – e.g. other muscle groups or aiming towards specific disorders. Both public and private partners are welcome.

DANISH IP FAIR
Inventions from Danish Research Institutions

Region Syddanmark

SDU

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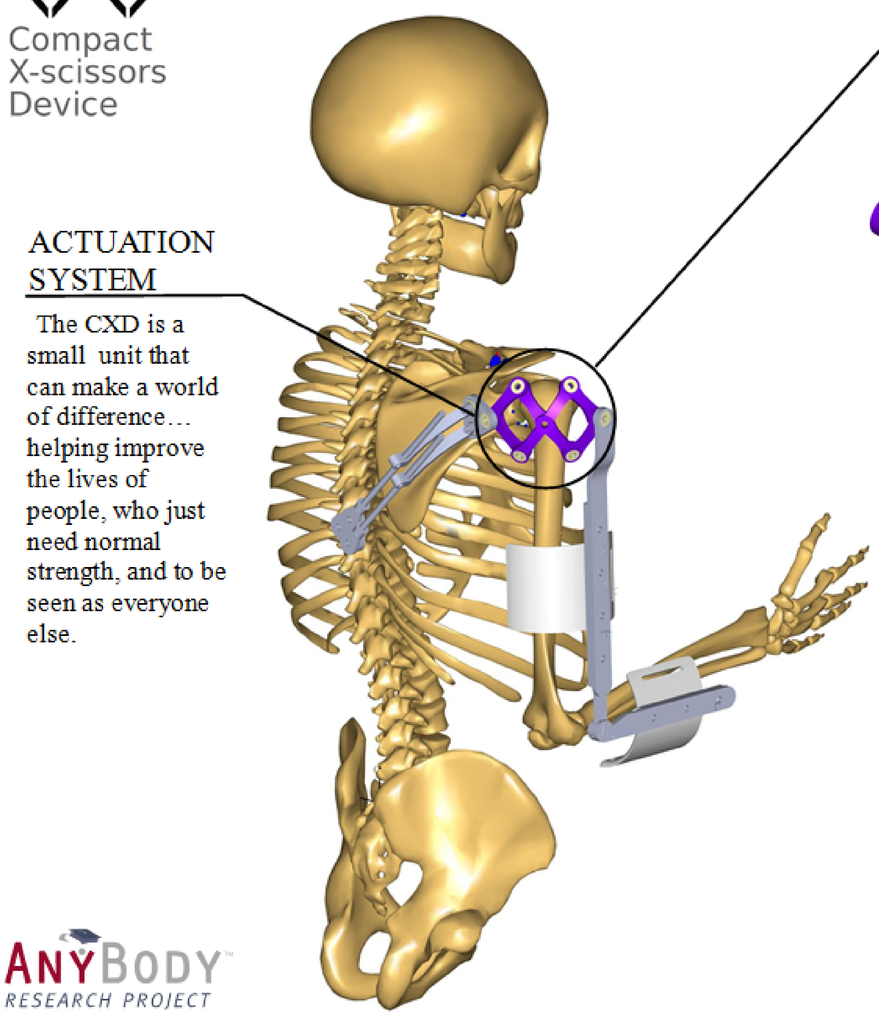
CXD – Compact X-scissors Device

Medtech & Diagnostics

Value proposition

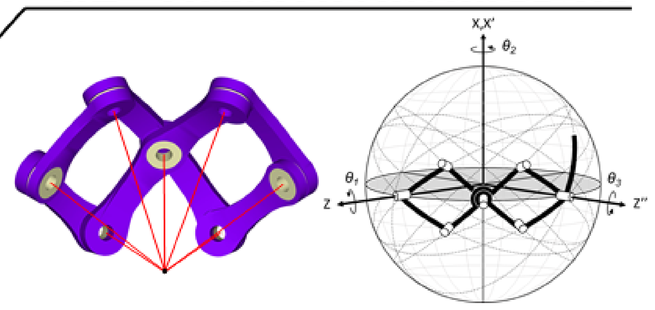
- An award-winning device for shoulder applications such as orthoses and medical exoskeletons
- Compact and scalable mechanical joint capable to fit anyone
- High degree of control and precision with full range of motion, with three degrees of freedom

Compact X-scissors Device

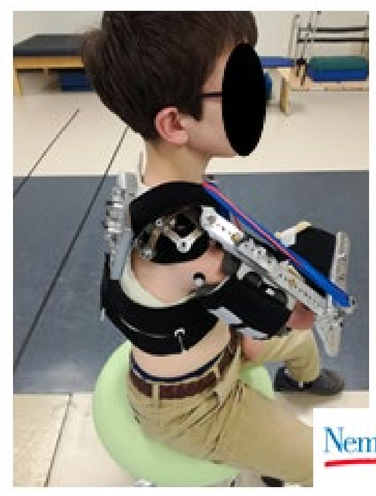


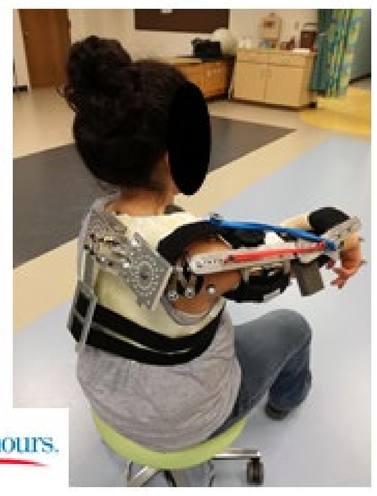
ANYBODY RESEARCH PROJECT

CXD – COMPACT X-SCISSORS DEVICE



- 3-degree-of-freedom spherical joint (no singularity)
- All joint axes meet in a common center of rotation
- Full compatibility with the human shoulder joint
- High kinematic performance and structural stiffness
- Most compact component of its kind
- Currently, the device is body-powered only





The CXD (Compact X-scissors Device) is a mechanical joint intended to **support patients at risk of shoulder subluxation** after having suffered from a stroke. Shoulder subluxation refers to partial dislocation of the shoulder joint. This occurs when the upper arm (humerus) partly comes out of the glenoid socket in the shoulder. The CXD can rotate as a well-functioning human shoulder joint and is placed outside the clothes. Currently, we're working on building the **next-generation of shoulder orthoses**; a shoulder-stabilizing orthosis for stroke patients.

Technology Description

The CXD (short for Compact X-scissors Device) is a spherical scissors mechanism capable of three rotations, thereby mimicking the behaviour of a spherical joint. The mechanism moves on an imaginary sphere with a constant rotation centre and an arbitrary radius determined by the design parameters. Since there is a void space within the mechanism, it is suitable for applications where the mechanical parts surround a given object or workspace. The mechanism is particularly well suited to support anatomical, spherical joints such as the shoulder and the hip, thereby solving a problem that has been haunting the fields of orthotics and exoskeletons for decades

Intellectual Property Rights

Two patent applications filed on October 17th, 2017 and on April 24th, 2019 regarding the mechanism and its control means are owned by Aalborg University and are intended to be licensed to the spinout company under an exclusive licensing agreement.

The Inventors


Miguel N. Castro (Researcher) Aalborg University


John Rasmussen (Professor) Aalborg University


Michael S. Andersen (Assoc. Professor) Aalborg University


Shaoping Bai (Assoc. Professor) Aalborg University

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Technology Transfer Manager
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Current State

Prototype 7 has entered **0-series production for clinical validation and testing** on patients and is currently undergoing **CE marking process** as an accessory for medical devices (Class 1). The CXD will be sold to orthotists that adjust the device to individual patients. It is our ambition to develop a standardised orthosis with CXD.

Watch an introduction to CXD in orthotics: bit.ly/30xUb3v

Call to action

In order to bring this and new products to market, we are seeking for:

- Experienced and skilled people willing to join the team to start the spinout
- Funding and/or Investors
- Licensee
- Partners and/or Research Collaboration

DANISH IP FAIR
Inventions from Danish Research Institutions

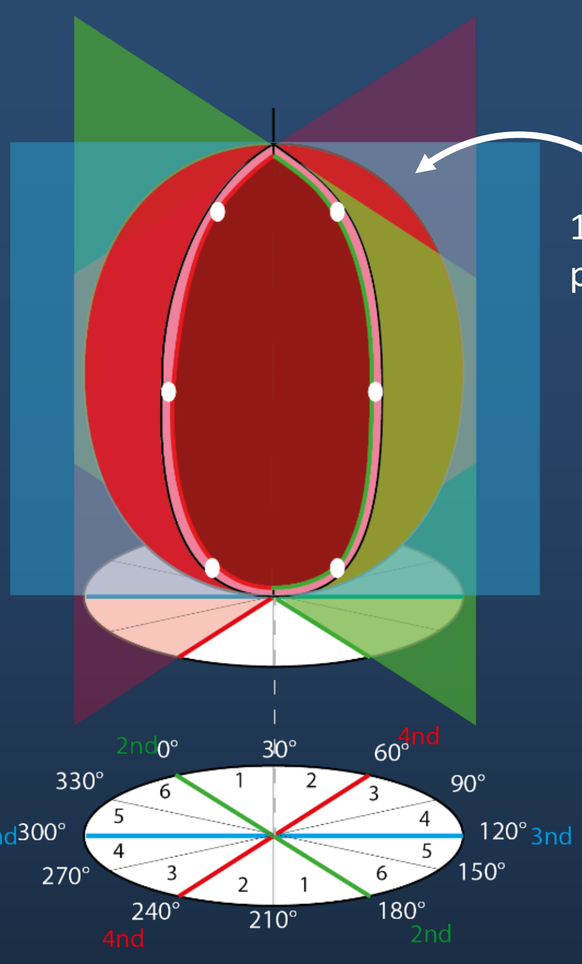
BREAKING NEW GROUND
AALBORG UNIVERSITY

Comprehensive analysis of cardiac contraction using ICA-DETECT

Medtech & Diagnostics

Model of left ventricle

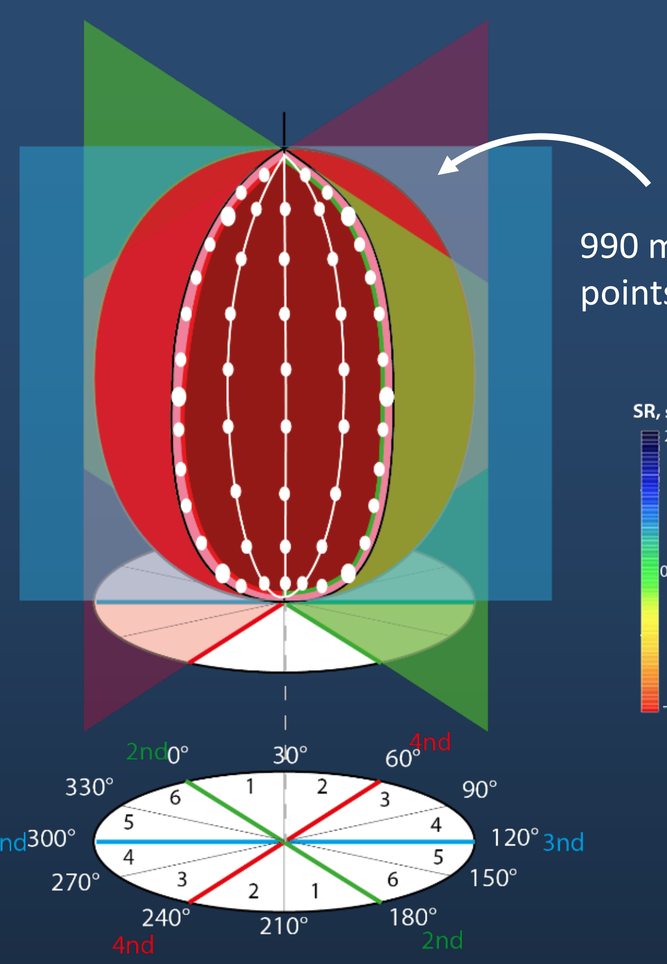
TRADITIONAL METHOD



Massive areas of cardiac muscle are not measured by current 2D ultrasound techniques

ICA – index of contractile asymmetry

ICA-DETECT



Mathematical calculations are used to estimate contractile information in the entire cardiac chamber

ICA-DETECT gives a full overview and uses all available data

Extensive data for machine learning

Technology Description

ICA-DETECT creates 3D heart deformation data from 2D ultrasound scanning, using interpolated data from cardiac movement. This enables a quantitative and qualitative assessment of the heart's deformation with a high time-resolution. The estimation of the heart's contraction is made from a significantly larger area of the heart, giving a better representation of the function. The visual representation provides timing and contraction information in a dynamic 3D-perspective.

We have demonstrated that quantification of contractile asymmetry based on the present method is associated with functional improvement in patients with heart failure undergoing implantation of biventricular pacemaker.

As this approach is based on all acquired data from heart images, a thorough assessment of myocardial function is feasible. Importantly, the present method provides extensive data for artificial intelligence, particularly machine learning using neural networks.

Intellectual Property Rights

Patent pending CA2994617, AU2018200974, February 9th, 2018, owned by North Denmark Region.

Team

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Department of Cardiology
Aalborg University Hospital

Peter Søgaard, MD, DMSc
Department of Cardiology
Aalborg University Hospital

Niels Husted Kjær
Chief Executive Officer
Alexandra Institute, Aarhus

Henrik Pedersen
Head of Visual Computing Lab, PhD
Alexandra Institute, Aarhus

Current State

Data collection for ICA analysis from regular 2D heart ultrasound images is available as a working prototype.

Method paper has been published in October 2019: https://rdcu.be/b1YO4.

Patient prognostication and early disease detection in a cohort of 4,500 healthy individuals based on deep learning is in planning stage.

Business opportunity and Call to action

Looking for funding of research on machine learning using ICA-DETECT for early heart disease detection and improved prognosis.

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Inventions from Danish Research Institutions

ALEXANDRA INSTITUTE

AALBORG UNIVERSITY HOSPITAL

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