

## Summaries winning PIHC research proposals

### **ALICE: An AI-based explainable support system for classifying clinical EEG**

Artificial intelligence (AI) can assist in interpretation of clinical EEG for diagnostics of e.g. epilepsy or coma. However, most AI techniques focus on single disorders and are not trained for multiple disease categories, limiting general clinical applicability. We will realise a virtual assistant (ALICE) that can both classify clinical EEG in multiple categories and detect several anomalies in single EEG recordings, using “multi-label-AI-classification”. ALICE provides a full report by using explainable AI. ALICE can assist clinicians in their visual reviewing of clinical EEGs and provides low-cost universal access to vital diagnostic care.

**Prof. dr. ir. Michel van Putten (MST)**, Dr. Maryam Amir Haeri (UT), Dr. Marleen Tjepkema (MST)

### **Functional Ultrasound Measurements of the Pelvic Floor and Anal Muscles: a Explorative Study**

In this project we develop, optimize and clinically implement a functional ultrasound tool (FEM-tool) to quantitate the pelvic floor muscle function. Pelvic floor physiotherapy is not effective for all patients with pelvic organ prolapse. With the FEM-tool we want to quantify the effectiveness at the start of the physiotherapy. This new tool will allow several pelvic floor disciplines, physiotherapists, gynaecologists and surgeons, to measure the pelvic floor function and incorporate this in their patient care. This will propel the pelvic floor care in Twente towards a leading position in the Netherlands.

**Dr. ir. Frieda van Limbeek-van den Noort (UT)**, Dr. Anique Bellos-Grob (UT), Prof. dr. ir. Chris de Korte (UT), Nadia Nijhuis MSPT (ZGT), Sandra Braunius MSPT (ZGT), Anita Reekers MSPT (ZGT), Ilse Hoepman MSPT (ZGT), Marleen Wieffer-Platvoet MSPT (MST), Marjolijn Lutke Holzik-Mensink MSPT (MST), Dr. Angelique Veenstra-van Nieuwenhoven MD (ZGT), Annemarie van der Steen MD (ZGT), Ad Claassen MD (ZGT), Dr. Martijn Lutke Holzik (ZGT), Dr. Claudia Manzini MD (Diakonessenziekenhuis Utrecht)

### **Developing a PROMising technique to MEasure THE 3D ground reaction force using prEssUre insoleS (PROMETHEUS study)**

Motion analysis is an important tool to evaluate functioning after, for instance, a reconstructed anterior cruciate ligament, stroke or in osteoarthritis. However, motion analysis is often focused on joint angles while these are the result of forces acting on the body (ground reaction forces (GRF)) and within the body (joint reaction forces). Analysing 3D GRF allows us to move beyond joint angles and better understand what happens in the body. Currently, 3D GRF can only be measured with force plates, limiting measurements to a gait laboratory. Hence, PROMETHEUS develops wearable and cheap pressure insoles to measure 3D GRF anywhere.

**Marit Zandbergen MSc (OCON)**, Dr.ir. Ali Sadeghi (UT), Prof.dr. Jaap Buurke (UT), Dr. Jasper Reenalda (RRD), Roy Hoogeslag MD (OCON), Dr. Judith Olde Heuvel (OCON)

**How do we win the opioid war? An “intelligent” medication dispenser, the solution to prevent the misuse of pain medication.**

Over the past 10 years, the use of oxycodone (an opioid) in the Netherlands has almost quadrupled. It is very worrying that 10% of patients are at risk of addiction. Oxycodone is frequently prescribed in the home situation, mainly postoperatively and for chronic complaints of the musculoskeletal system. Currently, there is limited control on the exact dosis and correct use of pain medication, which increases the risk of addiction. In order to optimize the use of pain medication, we aim to develop an “intelligent” medication dispenser. Using an algorithm, based on the existing pain protocol and the patients pain score, the dispenser will provide the correct pain medication. The existing medication dispensers only administer medication on programmed time points. Using the “intelligent” medication dispenser, we aim to make a step from only delivering medication to also dosing medication. The aim of this project is to develop and validate this system which eventually can reduce the use/abuse of opioids.

**Dr. Ydo Kleinlugtenbelt MD (DZ)**, Dr. Françoise Siepel (UT), Prof. dr. Frank Jansman (DZ), Dr. Ellie Landman (DZ), Dr. Remko Soer (Saxion), Toon de Groot MSc (UT), Drs. B. Staffhorst (DZ), Drs. J. Cobben (DZ), Drs. M. Jansen (HCDO)

**‘Patients-like-me’ shared decision making dashboard for breast cancer treatment.**

Of all women, 15% will develop breast cancer. Treatment choice is now mainly based on prognosis, while long-term outcomes, such as pain or fatigue, should also be considered when choosing the most appropriate treatment option. At present, these outcome parameters are insufficiently transparent for patients and professionals. In this project, we further develop an innovative digitally data-driven Patients-Like-Me (PLM) dashboard to support and personalize decisions about breast cancer care together. This includes both prognosis and real-world long-term outcomes. We are also evaluating the PLM dashboard in a pilot study with 20 breast cancer patients.

**Dr. Anneriet Dassen (MST)**, Dr. Daniel Evers (ZGT), Prof. dr. Sabine Siesling (UT), Dr. Nelly van Uden (Santeon), Dr. Annemieke Konijnendijk (Santeon), Drs. Anne Vogelaar (Santeon)

**BrAIInSHIFT: an innovative AI tool to select Subdural Hematoma Invasive or Follow-up Treatment**

A chronic subdural hematoma (cSDH) is a hematoma between the skull and the brain. Hematomas put pressure on the brain, leading to headaches, neurological deficits and cognitive disorders. Treatment options are surgical intervention or monitoring. The choice of treatment is based on the midline shift of the brain, assessed in CT. However, the midline shift does not quantify how different parts of the brain are affected by a cSDH. In this project, we will develop a new CT-derived parameter that is based on artificial intelligence and can quantify local deformation at each point in the brain: the brain deformation field.

**Dr. Elina Thibeau-Sutre (UT)**, Drs. Kuan Kho (MST), Dr. Jelmer Wolterink (UT), Drs. Jorieke Reimer (MST)

### **CHARISMA: PREDICTION OF HEPATOCELLULAR CARCINOMA USING MRI RADIOMICS**

Incidence of primary liver cancer (hepatocellular carcinoma, HCC) is increasing, mainly caused by the rapid increase in (obesity-related) chronic liver disease. The risk for HCC development is not reflected in laboratory testing. At MST, a large population of patients with chronic liver disease underwent annual MRI scanning for HCC screening. This provides an opportunity to study the usefulness of artificial intelligence. We will use the latest techniques to extract features in MRI images to identify patients at risk. The method will be validated in similar populations.

**Dr. Maureen Guichelaar MD (MST)**, Dr. Stéphanie van den Berg (UT), Dr. Maryam Amir Haeri (UT), Donald Bouman MD (MST; MRON)

### **Developing the ‘Twente foot model’**

Foot reconstructions in Charcot foot or neuromuscular disorders are largely performed on the carpenter's eye. The rule is, that if it looks like a normal foot, it's good. The problem is that the surgeon cannot objectively estimate the distribution of forces after reconstruction. In this project, we aim to create the “Twente foot model”, a model of rigid structures and soft tissues based on a dataset with MRI scans and dynamic data. This model is used for surgical planning with the postoperative pressure distribution in mind. The new rule: "If it looks like a Twente foot, then it's good."

**Drs. Wouter ten Cate (ZGT)**, Dr. Elgun Zeegers (MST), Ir. Edsko Hekman (UT), Dr. Kilian Kappert (ZGT), Dr. Femke Schröder (UT; MST)

### **Ultrasound-driven micro-Robots for GastroEsophageal caNcer Therapy (URGENT)**

Gastroesophageal junction (GEJ) adenocarcinoma is an aggressive form of cancer that has a poor prognosis even after combined chemotherapy and surgical treatment. Since GEJ carcinomas occur in the transition area between the stomach and oesophagus, there is often also involvement of the stomach, and local endoscopically-assisted radiotherapy is not possible. As a result, there is an “URGENT” need for innovative treatment options. Our solution is to develop a new method of delivering anti-cancer drugs to such difficult-to-reach tumors using wireless deployment of drug-loaded microrobots. Such therapeutic microrobots will enable GE cancer treatments to be more effective and less invasive.

**Dr. Sumit Mohanty (UT)**, Prof. dr. Sarthak Misra (UT), Dr. Henri Braat (MST)

### **Diet of unprocessed food supported by an app for integration in obesity care for children**

Current childhood obesity care is aimed at acquiring and maintaining a healthy lifestyle, by reducing energy intake and increasing energy expenditure. However, this often doesn't lead to the desired result. Healthcare professionals argue in favor of a diet of unprocessed foods, rather than energy restriction. In addition, children and parents demand for more intensive, easily accessible guidance to support their behavioral change.

This project aims to optimize, together with end-users, the current obesity treatment protocol including a diet of unprocessed foods and to develop an app prototype that provides intensive support to children and parents during the behavioral change process.

**Dr. Marloes Postel (Saxion)**, Dr. Ellen van der Gaag (ZGT), Drs. Joanne Goorhuis (MST), Dr. Marjolein Brusse-Keizer (MST), Dr. Marjolein den Ouden (Saxion), Dr. ir. Jos Thalen

(Saxion), Dr. ir. Danny Plass (Saxion), Matthijs van Veen (Saxion), Dr. Marloes Vermeer (ZGT), Prof. dr. Vera Araujo-Soares (UT)

**AMIRA - Angioplasty Multipurpose Intravenous Laser-Atherectomy Catheter**

Current minimally invasive methods for treating arterial occlusive diseases involve multiple guidewires and catheters that deliver stents and balloons inside the diseased arteries. False routes of these delivery tools through the occluded artery are one of the most significant risks to overcome – especially if the path is blocked by calcified material (calcified Chronic Total Occlusions (cCTO)). This project introduces AMILA - a novel revascularization tool based on laser angioplasty. This tool will reach and treat blocked arteries effectively. It even has the potential to present a novel, safe, and feasible approach to address cCTOs in small and tortuous vessels.

**Dr. Christoff Heunis (UT)**, Prof. dr. Bob Geelkerken (MST), Giulia Sereni MSc (UT), Bryan Wermelink MSc (MST), Dr. Theo Menting (MST), Prof. dr. Sarthak Misra (UT)