

A person in a white lab coat is shown from the back, interacting with a digital interface. The interface consists of a grid of hexagonal icons, each containing a different symbol: an atom, a heart with a pulse line, a person silhouette, a DNA helix, and a microscope. The background is a dark blue gradient with a faint world map outline in the bottom left corner.

**THE** SHAPING A  
**TECHMED** HEALTHY  
**EVENT** FUTURE

A person is shown from the back, wearing a light-colored long-sleeved shirt, with their hands raised as if interacting with a digital interface. The background is a dark blue gradient with a pattern of white hexagons. Inside these hexagons are various icons: a DNA double helix, an atom, a heart, a microscope, and a person silhouette. On the left side, there are white, stylized plant or branch graphics.

# Textiles in Healthcare — Developing technologies from the applications' perspective

Hellen van Rees – **Saxion Research Group Sustainable & Functional Textiles**

# DISCLOSURE SLIDE

*Project:* ACHILLES made possible by Pioneers in Healthcare

*Partners:* Saxion, MST, DZ

*Project:* Wearable Breathing Trainer made possible by Regieorgaan Sia, Pioneers in Healthcare & Creative Industries Fund NL

*Partners:* Saxion, UT, MST, DZ, Paediatric physiotherapists in Netwerk Inspanningsklachten, Panton, Breathpal, Elitac, Ontwerpstudio HvR, Modint

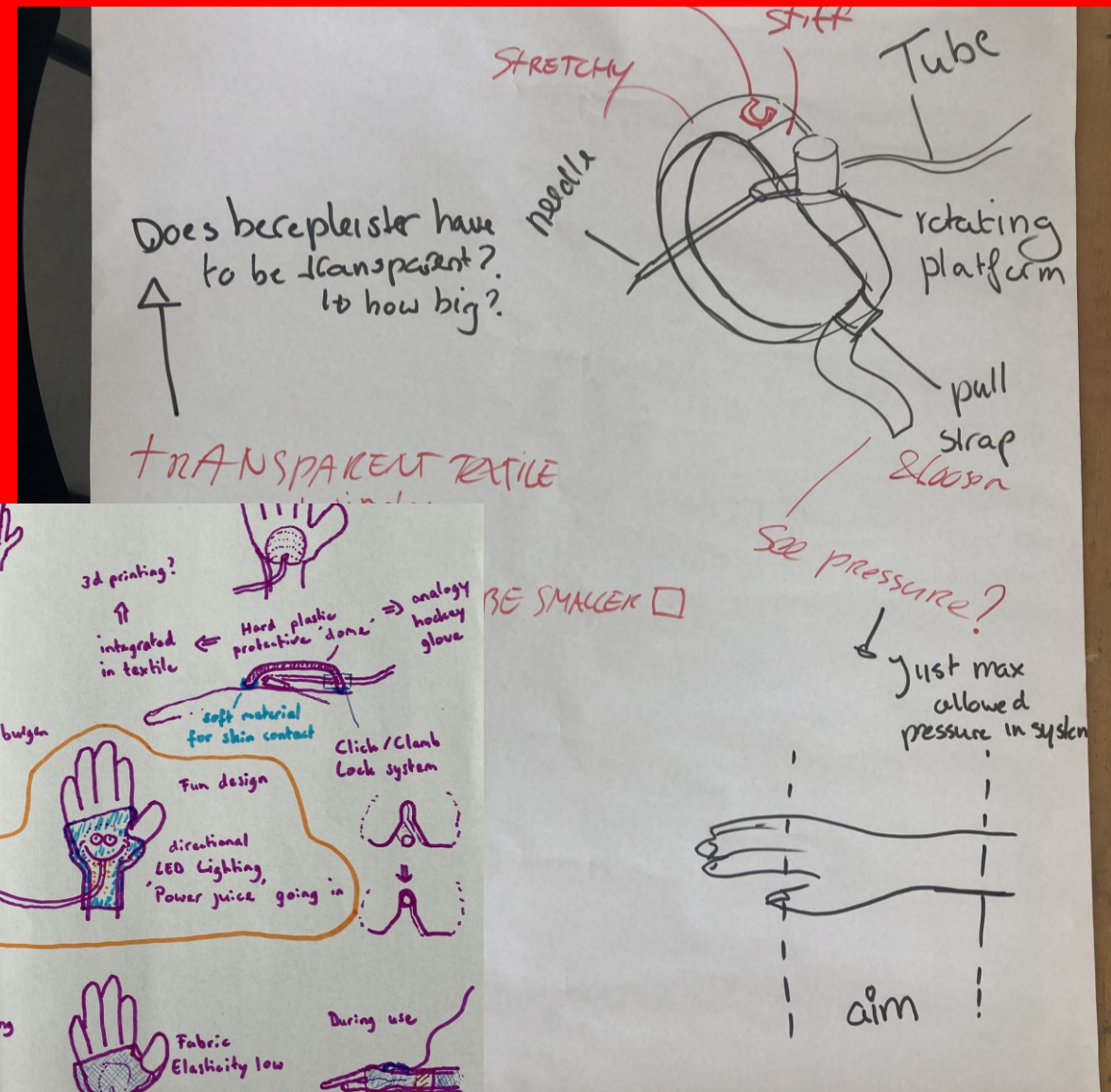
# ACHILLES

Advanced Child friendly IV Line Lock Early warning Sleeve

- improve fixation of the IV line
- reduce stress through a fun design
- early warning system for imminent IV dysfunction



# Project kick off



# Baseline

Yael Weterholt, Romi Sprengers

- first attempt to place an IV in children succeeds in less than 50%
- dislocation occurs in up to 35% of children in spite of tape, splint, bandages.

*“I prefer not to see it completely, which is why I want the IV to be bandaged” [Participant 5, 12yrs]*

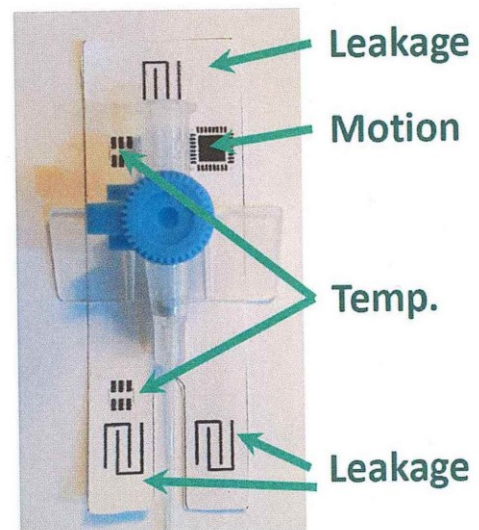
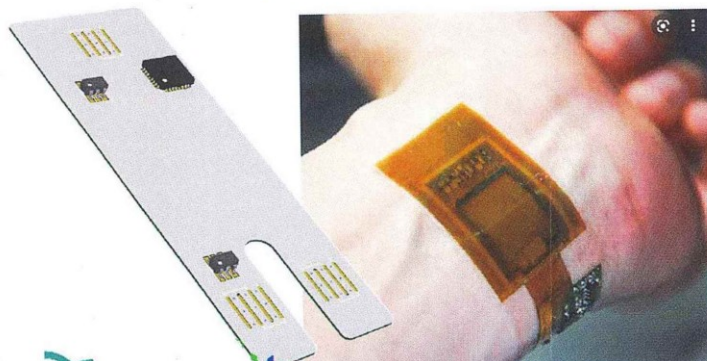
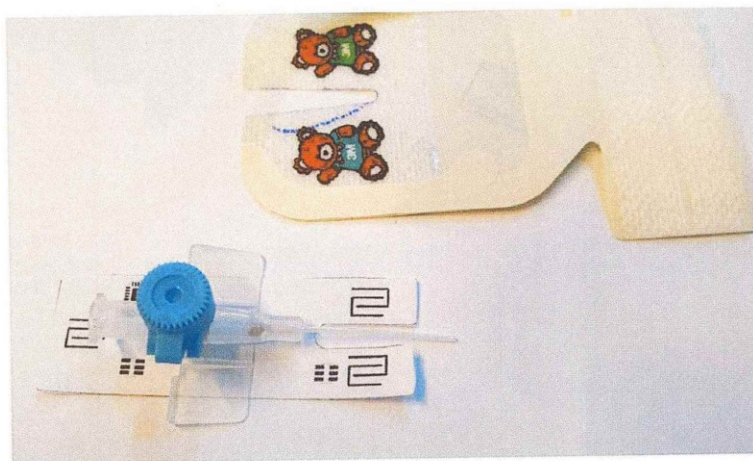
*“It might be more convenient than it is now, but not much more convenient I think.” [Participant 203, doctor]*

Table 3: Duration placement IV in minutes

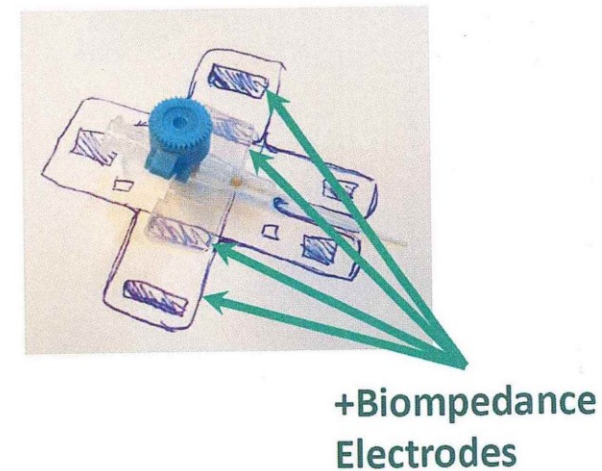
|   | <u>Median(IQR)</u> | <u>1<sup>st</sup> Quartile</u> | <u>3<sup>rd</sup> Quartile</u> |
|---|--------------------|--------------------------------|--------------------------------|
| Inserting the needle                    | 7.0(7.0)           | 3.0                            | 10.0                           |
| Taping                                  | 3.0(3.0)           | 2.0                            | 5.0                            |
| Bandaging                               | 2.5(1.0)           | 2.0                            | 3.0                            |
| Total duration                          | 16(6.0)            | 12.0                           | 18.0                           |
| Attempts needed to successful placement | 1(1.0)             | 1.0                            | 2.0                            |

# Sensor System - concept

Dr. Javier Ferreira-Gonzalez & Dr. Eyuel Ayele



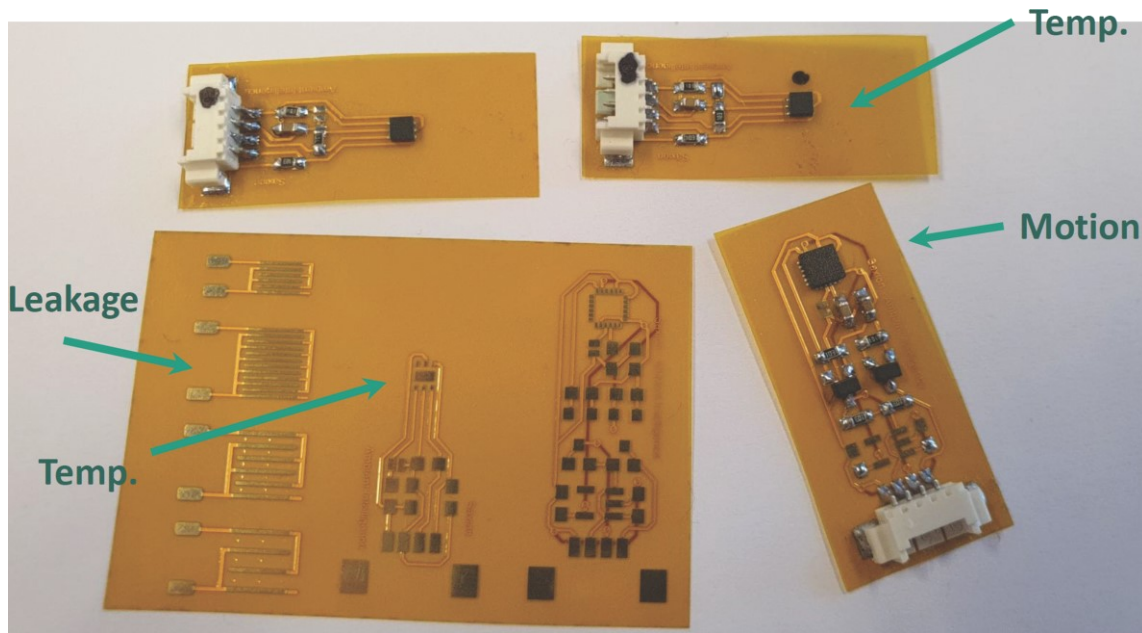
IV-Sensor-v1



IV-Sensor-v1.1

# Sensor System - prototype

Dr. Javier Ferreira-Gonzalez & Dr. Eyuel Ayele



dr. Eyuel D. Ayele, dr. Javier Ferreira-Gonzalez

Ambient Intelligence Research Group, Saxion University of Applied Sciences, M. H. Tromplaan 28, 7513 AB, Enschede

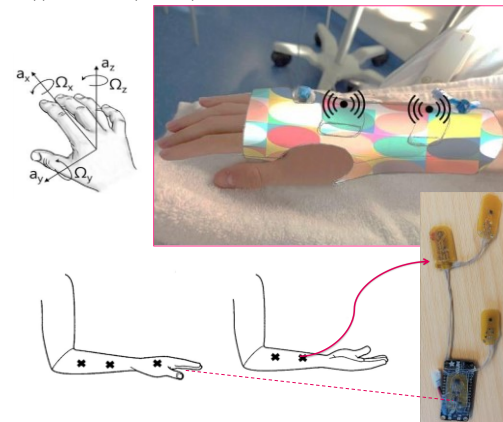
\*corresponding author, e.d.ayele@saxion.nl

## Introduction

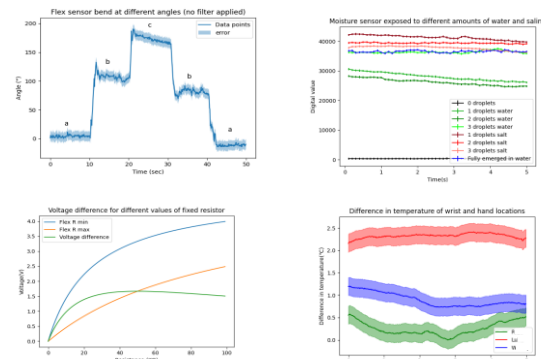
**Context:** Intravenous (IV) therapy in pediatric patients, particularly children, is often associated with stress and discomfort. The main challenge is maintaining the infusion line throughout the therapy period, which is often accompanied by stress and discomfort for pediatric patients.

**Objective:** This study aims to a child-friendly "smart sleeve" that not aims to reduce stress and discomfort, but also provide an early warning system for IV dysfunction.

**Solution:** Combining sensor technology and functional design, the smart sleeve addresses the challenge by offering two aspects: sensor data monitoring for early detection of IV dysfunction, and a comfortable, stabilizing sleeve design that allows freedom of movement. The hardware and software setup includes a flexible PCB sensor board design with embedded software for data monitoring and activity detection. Preliminary results demonstrate the effectiveness of this approach in identifying the optimal activity state of the hand, ultimately leading to reducing stress and enhancing IV therapy outcomes for pediatric patients.



## Preliminary IV moisture and body temperature data

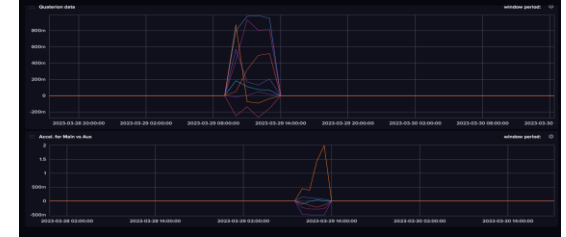


## System Monitoring

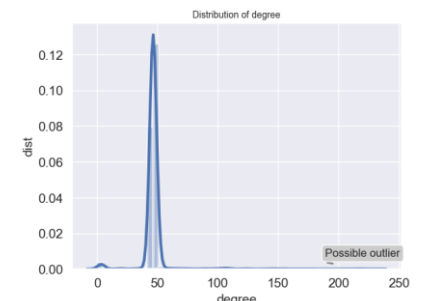
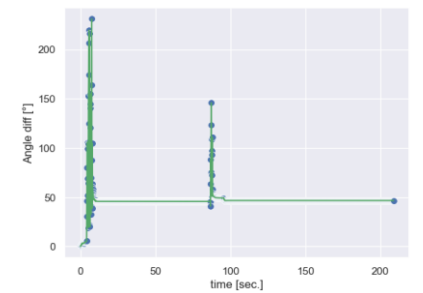
### Realtime skin surface temperature



### Realtime movement data



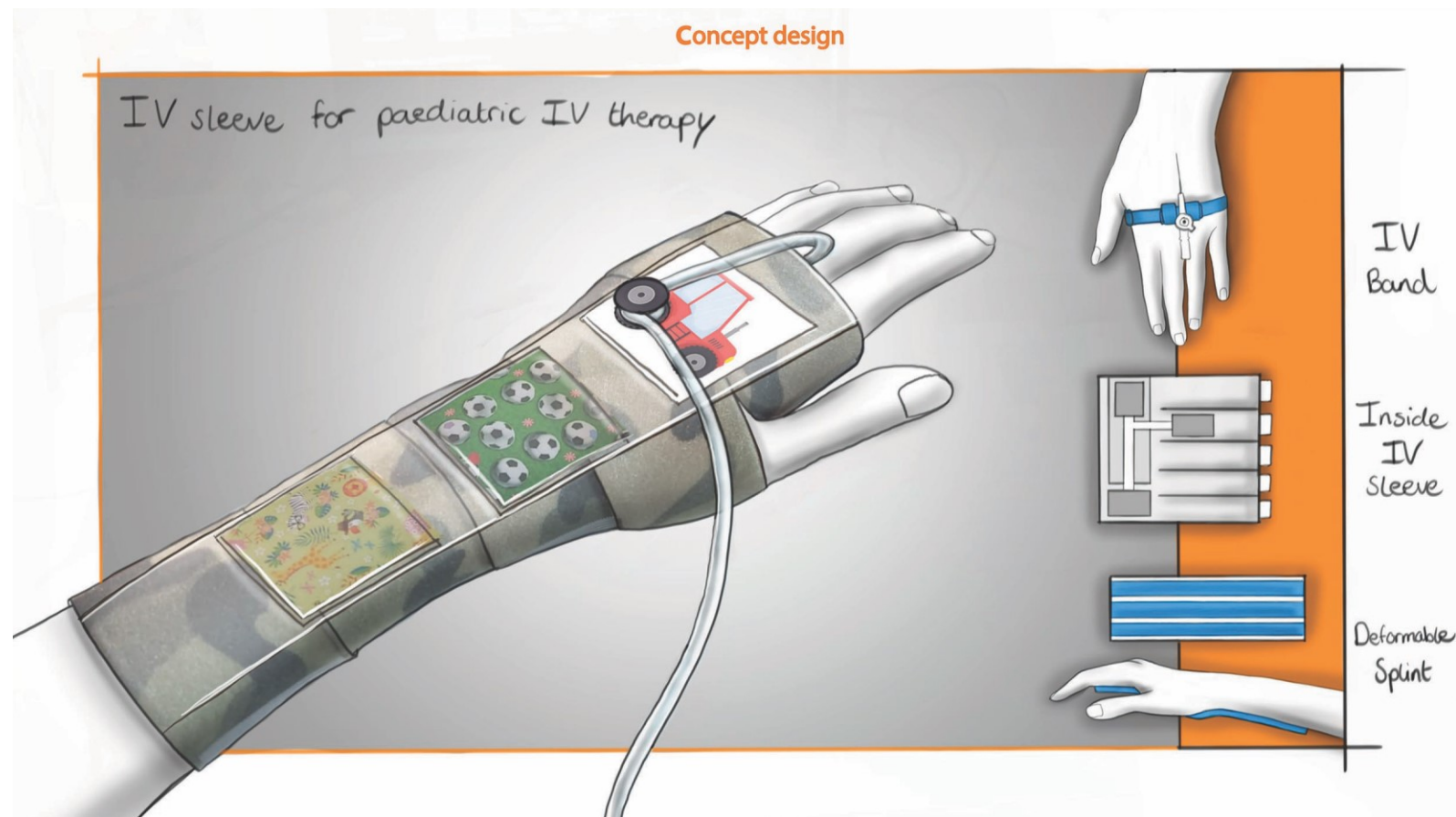
## Hand posture angle assessments





# Co-Design

Evie Jansen



# Sleeve prototypes

Hellen van Rees & Eliza Bottenberg



# User Evaluations

Vera Hengeveld, Mattienne van der Kamp & Kim Kamphorst

*Goal:* insight in user experience of new prototypes in comparison with current situation

Observational, explorative prospective research in Medisch Spectrum Twente (MST) & Deventer Ziekenhuis (DZ).

*Setting:*

Paediatric physician & nurse, child & parent, researcher.

Results part 1 in MST (6 groups)

## **Strap**

- + Less steps
- + Feels softer, and undoing more child friendly
- Makes insertion more difficult
- Distance between skin

## **Sleeve with splint**

- + Quick & easy to use & check
- + Arm is stable and at the same time the child has more freedom
- + Looks nice
- + Re-usable
- Perhaps the sleeve can slide?
- Perhaps because it looks nice, children will touch it more or undo it?

**Ideal combination:** current needle fixation, new sleeve with splint

**Time:** (indication excluding insertion) 5 minutes

# WBT

Wearable Breathing Trainer

Saxion Hogeschool (SFT & TH&C)

Universiteit Twente (IxD & HMI)

Breathpal

Elitac Wearables

Panton

Ontwerpstudio Hellen van Rees

Netwerk Inspanningsklachten

Medisch Spectrum Twente

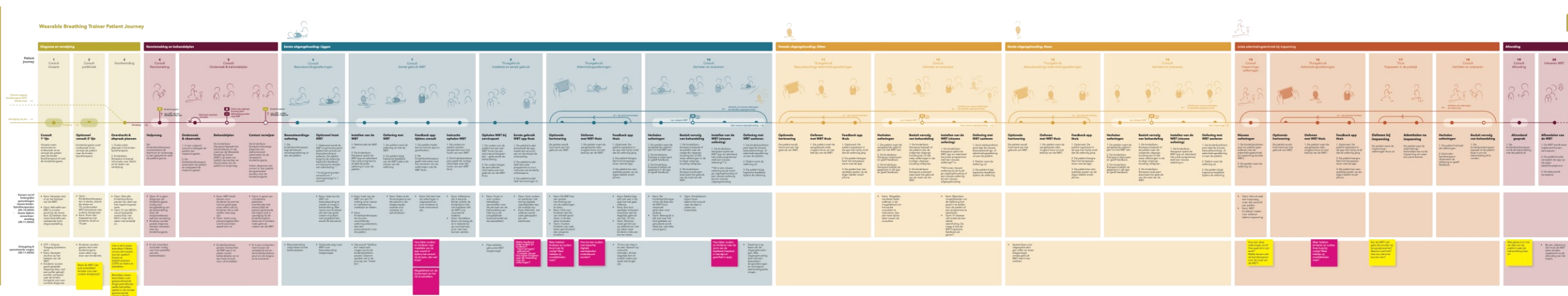
Deventer Ziekenhuis

Bracheorganisatie Modint



# Patient Journey

## Wearable Breathing Trainer



Patient journey – not product journey -  
 Insight in the approaches of the paediatric physiotherapists  
 Therapy phases & goals  
 Functions of the WBT in each phase  
 Develop technology accordingly – (self adjusting to each persons breathing)



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[TIME SESSION] | [SESSION TITLE] | [SPEAKER]