Appendix

Improving Shared Understanding with Hart

designing a telemonitoring smart care agent to support transcatheter aortic valve implantation patient care in perioperative journey

Winnie (Wei Ju) Chen

Supervised by
Prof. dr. Gerd Kortuem / Prof. dr. Maaike Kleinsmann
Project brief

A - biosensor documentation
B - List of scanned website
C - Observations
D - Sensitising probe
E - Interview questions and highlights
F - Impression of analysis process
G - TAVI perioperative journey
H - Stakeholder interview with Philips
I - Impression on storyboarding
J - Others

Explore the details of the final design concept:
https://miro.com/app/board/o9J_knEK6aM=/
Project brief

IDE Master Graduation
Project team, procedural checks and personal project brief

This document contains the agreements between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organization, however, this does not cover any legal or employment relationship that the student and the client (right) agrees upon. Hence, this document facilitates the required procedural checks in this document:
- The student defines the team, what he/she is going to do/deliver and how that will come about.
- IDE & E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME
Save this form according the format IDE Master Graduation Project Brief "family name _"first name_ student number_ date of birth_year_". Complete all blank parts of the form and include the approved Project Brief in your Graduation Report as Appendix 3.

Family name: Chen
Initia: W.J.
Student number: 4939114
Date of birth: 09-09-1994
Gender: Male
Address: Wesselingweg 123
Phone: 0031-6-12345678
Email: chen.w.j@example.com

Your master programme (only select the options that apply to you):
- IDE master
- 2nd non-IDE master
- Individual Programme: [ ] (please date of approval)
- Honours Programme: [ ] Honours Programme Master
- Specialisation: [ ] Tech in Sustainable Design
- Other: [ ] Entrepreneurship

SUPERVISORY TEAM**
Fill in the required data for the supervisory team members. Please check the instructions on the right.

Chair: Geert Wijnen
Department: IoT
Address: Wesselingweg 123
Phone: 0031-6-12345678
Email: chen.w.j@example.com

Second mentor: Maaike Kleinmann
Department: MCO
Address: Wesselingweg 123
Phone: 0031-6-12345678
Email: chen.w.j@example.com

This graduation project is in collaboration with TU Delft Cardiolog, Philips Research and the cardiology department of the Amsterdam AMC.

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v.
- Second mentor only applies in case the assignment is hosted by an external organization.
- Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

Formal Approval Graduation Project
To be filled in by the Board of Examiners of IDE & Delft. Please check the corresponding box and sign this Project Brief, if you do not have the criteria below.

>> YES all 1st year master courses passed
>> NO missing 1st year master courses are:

Master electives no. of EC accumulated in total:
- Of which, taking the conditional requirements into account, can be part of the exam programme:
- List of electives obtained before the third semester without approval of the BoE:

Chair: Geert Wijnen
Signature: ____________________________
Date: 4-4-2020

Comments:

IDE TU Delft - E&SA Department // Graduation project brief & study overview // 2018-01 v00

Instructor/Name: W.J. Chen
Student number: 4939114
Title of Project: Design shared understanding for AS care path via sensor telemonitoring

Page 1 of 7

IDE TU Delft - E&SA Department // Graduation project brief & study overview // 2018-01 v00
Design shared understanding for AS care path via sensor telemonitoring

In the aging society, aortic valve stenosis (AVS) is a prevalent progressive heart disease, where a narrowing aortic valve restricts the blood flow and can eventually lead to heart failure. In severe cases, AVS patients are being admitted to transcatheter aortic valve implantation (TAVI), as a less invasive replacement treatment.

This thesis looks into the Philips biosensor, a wearable device that collects vital signs (like heart rate, respiration rate and posture data) for a non-invasive and ambulatory care case. With the use of wearable biosensor and the collected data, data-driven design interventions will potentially improve the AVS patients’ doctor relationship. The end goal of the project is to mitigate healthcare burden and enhancing patient’s quality of life.

In a previous TULI-FAV study [1] from Amsterdam UMC and Twente University, the reliability and physical usability of the wearable device is examined. However, an overview of the care journey, exploration of possible solutions and understanding the meaning of the sensor data for different actors are lacking.

With the above in mind, this project aims to understand the barriers/enablers of shared understanding of different actors in AS care path and generate near future design concepts to improve shared understanding in telemonitoring solutions.

Supervised by Prof. dr. Gerd Korten and Prof. dr. Maaike Klaesemann, the design researcher will graduating within TU Delft CardiLab. Collaborating with Philips Research and Amsterdam UMC, it will be established to generate supportive insights from both academic and practical perspectives.

References:
Problem Definition

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (~20 full-time weeks or 100 working days) and clearly indicate what issues should be addressed in this project.

This project focuses on the perioperative care path of AS. The actors involved including the AS patients, caregivers (such as peer/patient/family), medical teams (such as AUMC), and sensor technology providers (Philips).

Emphasizing the current unique situation of COVID-19 and preliminary findings from stakeholder interviews, patients can be out of reach due to extreme pandemic measures, difficulty in traveling or personal reasons. Such lack of inclusiveness is a threat for delivering quality of care. By incorporating sensor technology for telemonitoring, it could potentially build a more inclusive care path for both patients and medical care teams.

However, the challenge of remote communication is to come to a shared understanding among different actors.

From medical team/sensor technology provider point of view:
A shared understanding of patients through collected data is essential for improving quality of care. The collected functional/mental data represents the health status of the patient for pre-surgery frailty assessment and enables medical staff to remotely track post-operative recovery progress in reality.

From AS patient/caregiver point of view:
A shared understanding between the medical team and AS patient/caregivers is critical for improving quality of life. Current patient-physician communication is highly relies on single face-to-face touch points. Telemonitoring enables patient to engage in more inclusive, personalised care plan.

To conclude, how would different actors understand and respond to the telemonitoring remains largely unknown.

Assignment

State it in 3-5 sentences what you are going to research, design, create and/or generate that will solve (part of the) issues pointed out in the “problem definition”. This illustrates this assignment by indicating what kind of solution you expect and/or aim to deliver, for instance: a product, product-service combination, an app, a survey, a tool, a product-service combination, ideas, … In case of a Specialisation and/or Internship, make sure the assignment reflects this.

This project aims to understand the barriers/enablers of shared understanding of different actors in AS care path and generate near-future design concepts to improve shared understanding in telemonitoring solutions.

How would different actors understand and respond to the telemonitoring is largely unknown, hence, this graduation project aims to (1) understand the barriers/enablers of shared understanding of different actors in AS care path and (2) generate near-future design concepts to improve shared understanding in telemonitoring solutions.

The following sub-research questions will be answered in each design stage:

1. What are the barriers and enablers of shared understanding among different actors in AS care path?
2. What are the possible near-future scenarios different actors facing through telemonitoring?
3. How can we use near-future scenarios as prompts and design concepts to improve shared understanding among actors?

Planning and Approach

Include a Gantt Chart that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given time of 30 EC (~20 full-time weeks or 100 working days), and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project. If any, for instance because of holidays or parallel activities.

* View Online Gantt Chart: https://tinyurl.com/xxxxxy

The project will kick off on 25th of March and aim to end on 31st of August.
Following the double diamond design approach, the research questions are answered through the following stages:

For the problem-finding phase, (1) Experts/Stakeholder Interviews and (2) Literature review on topics of tele-monitoring experience would be understanding the barriers and enablers to reach shared understanding among different actors in AS care path.

The limitation of this phase is the access to hospital and patients, which provide alternative, hence patient insights would be failed from experts and literature review. However, depending on the pandemic situation, (3) Patient interviews with context-mapping would be conducted to generate richer findings.

For the solution-finding phase, I plan to use near-future scenarios as a prompt to co-design possible solutions with stakeholders. (4) Insights analyzed from previous finding and (5) Findings from sensor data analysis will help to create a scenario worth discussing, (6) Feedbacks from the co-creation session will be extracted to conceptualise an intervention to improve shared understanding.

The limitation of this phase is due to the measurements, the feasibility to experiment on different storytelling techniques may be restricted (i.e., no video filming) and the researcher may need to seek alternative ways to facilitate co-creation session with AUMC and Philips. Exploration of online tools and stakeholder communication will be done to achieve ideal outcome.
MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example, acquired competences from your MSc programme, the elective academic extra-curricular activities (e.g.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in-depth knowledge on a specific subject, broadening your competences or experimenting with a specific tool and/or methodology, etc. stick to no more than five ambitions.

- My future career goal is to work with complex systems and make meaningful impacts through design.
- Regarding personal motivation, I understood the topic of “Designing shared understanding for different actors in AS care path via sensor telemonitoring” requires the ability to analyse the complexity of healthcare regimen. The research assignment in near future allows me to experiment using design fiction as a research tool to co-create possible solutions. Furthermore, graduating in a trying time of COVID-19 pandemic outbreak also challenges my skills as a designer to think creatively and positively.
- I believe from previous courses such as “Contextual and Conceptualisation”, “User Experience and Usability Assessment Design”, “Design for Emerging Market” have prepared me for fundamental knowledge as an interaction designer. My project experience including “re-designing Sunrise medical I/electrical wheelchair joystick module interaction for future elderly users”, “designing a ADI platform for autistic kid patient, parent, and therapist”, “contextual analysis for laparoscopic surgeries in LMICs” have equipped me to take on complex research challenges in healthcare context.
- Last but not least, I am thrilled to have the opportunity to co-work with my chair Gerd Kortuem, my mentor Maaike Kleinmaass, medical team from AUMC, and the Philips data team. Each one of them are respectful experts in their own fields and I expect myself to humbly learn from them. Recalling my first touching point of data-enabled design, it started from working with TGD Studio to explore the use of 3D body scanning technology in fitness and rehabilitation segment. In continuation of the design path, I proactively joined ThingsCon IoT conferences and join courses as “AI and Society” to seek inspirations. This graduation will be a great opportunity to further expand my experience towards data-enabled design.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.
Wearable biosensor

Wireless remote sensing device

Philips wearable biosensor provides a convenient and comfortable way to keep watch of patients in need of frequent monitoring. This self-adhesive biosensor automatically and continuously measures vital signs, body posture and step count, and detects falls.

Technische specificaties

Sensor technology

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG electrodes</td>
<td>Detects heart rate</td>
</tr>
<tr>
<td>Thermistor</td>
<td>Detects skin temperature</td>
</tr>
<tr>
<td>3-axis MEMS accelerometer</td>
<td>Detects motion</td>
</tr>
</tbody>
</table>

Form factor

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>30mm x 30mm x 9mm</td>
</tr>
<tr>
<td>Weight</td>
<td>17g, with integrated sensor module</td>
</tr>
</tbody>
</table>

Adhesive

<table>
<thead>
<tr>
<th>Grade</th>
<th>Adhesive Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gentle Grade</td>
<td>Silicone adhesive, recommended for low activity, low perspiration and low humidity levels</td>
</tr>
<tr>
<td>Active Grade</td>
<td>Hydrocolloid adhesive, recommended for moderate to high activity, moderate perspiration and moderate humidity levels</td>
</tr>
</tbody>
</table>

Battery

<table>
<thead>
<tr>
<th>Type</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc air battery (disposable with device)</td>
<td>Up to 4 days</td>
</tr>
</tbody>
</table>

1 The coverage area is the line of sight within 33 feet (10 meters) of the relay device. Beyond the coverage area, the patient needs to carry the relay device in a pouch for continuous or frequent measurement.


Detailed raw data collected are reference from <The Philips wearable biosensor in transcatheter aortic valve implantation treatment workflow Usability and feasibility of the wearable biosensor> (Braem, 2019, Chapter 3)
Facebook groups:
- Aortic Valve Replacement Group
- UK Aortic Valve Replacement Group
- Aortic Stenosis (support group and meeting place)
- Heart Disease Support Group
- Heart Valve Surgery Support Group
- Heart Disease - information and discussion
- Heart Disease Survivors Support Group

Youtube TAVI patient stories:
- https://www.youtube.com/results?search_query=Aortic+Valve+Stenosis+patient+story
- https://www.youtube.com/results?search_query=TAVI+patient+story

Hartstichting
https://www.hartstichting.nl/verhalen

HARTPATIËNTEN
https://www.hartpatienten.nl/

Harteraad
https://harteraad.nl/ervaringsverhalen/

BHF HealthUnlocked
https://healthunlocked.com/bhf/
posts/136175899/introducing-our-heart-stars

QuantifiedSelf
https://quantifiedself.com/show-and-tell/?topic=39

Mended Heart
https://mendedhearts.org/

Aortic Hope
https://www.aortichope.org/new-blog

Women Heart
https://www.womenheart.org/blog/

American Heart Association
https://supportnetwork.heart.org/

Care for your heart HK
https://www.careheart.org.hk/?page_id=85

Share my health journey
https://www.sharemyhealthjourney.com/post/zach-g-story
C - Observations

Pre-surgery group information session

A visit is paid to Amsterdam UMC and a patient group session is being observed. The observation started from following the specialist nurse leaving the heart team meeting room, preparation and full participation in the patient group session. After the session, unstructured interviews were done with a TAVI specialist nurse and a researcher.

Main impressions and discoveries from the observation are presented as follows: participants, procedures, artifacts, and roles of medical staff.

PROCEDURE

The aim of holding a patient group session is to provide TAVI-related information to the patients. The session is held in between a full day check-ups (such as CT Scan, ECG, and polyclinic). The whole group session lasted an hour with slide presentations. At the end of the session, 1-on-1 consultation was provided.

A discovery from the procedure is with the long length and large amount of information given, it is hard for the patients to absorb all. During the follow-up interview with the specialist nurse, they mentioned a TAVI patient folder is given to the patients at the end. If more information is desired, the patient can consult in the polyclinic or reach the heart team via phone calls.

PARTICIPANTS

Eight groups of patients were present, aged between 70 - 90, mostly accompanied by their family member, partner or caregiver. Learnt from the specialist nurse, the patients are brought to the group session room from 2nd floor heart department by the receptionist in between their check-ups.

Patient’s interaction and energy level are being observed, of which following findings are noted:

1. Energy level drops in the middle of the presentation, which the Patients seemed to be too exhausted keeping up with a long presentation.

2. Accompaniment of the family member or partner is important as a support. For example, at the end of the group session, the family members leaned in to help communication between patients and medical staff by giving supplementary information observed in patient’s daily life.

3. Interaction in groups is valuable. Patients showed keen interest to hear what are the similar questions others have in mind.

ARTIFACTS

A tangible heart model and an artificial valve model were displayed as supplementary education material. At the end of the session, the information was given to the patients in the form of paper leaflets. It is important to keep in mind the level of digital literacy and ensure readability for the patients.

ROLES OF MEDICAL STAFF

Five medical staff, including four specialist nurses and one researcher, were responsible for the group session. From unstructured interviews, the importance of this gathering was emphasised. For instance, one specialist nurse pointed out this is the first touchpoint both medical staff and patients meet in person, since most of the TAVI patients are referred from outpatient hospitals. Information giving is not only practical, but to manage expectation and ease anxious feelings.

"It is important that after the surgery, the patients return to their healthy life rhythm. Some patients think after the surgery they cannot move at all and take their pajamas planning to stay in the hospital bed all day... this is not good for them. It is important to let them know what they can do."

- Specialist nurse, 2020

Figure 12
A snapshot of the observed group information session.
Post-surgery online group rehabilitation coaching session

A remote rehabilitation session was observed (figure 12). Due to the strict measures of COVID-19 pandemic, CardioVitaal has been delivering remote exercise session to provide rehabilitation care. The unique situation provided an opportunity to understand how the trainers and patient interact remotely in their home environment.

The whole exercise session lasted for an hour and divided into three parts. Within each part, the instructor gave a set of physical activities with gradually increased intensity (figure 11). Two physical trainers (one as instructor/another as observer) and three patients participated. Main impressions and findings are discussed.

**FINDINGS**

1. **Trainer’s role in teleconsultation**

The trainer constantly switched between the role of a guide and an evaluator in the remote rehabilitation:
- After every session, the trainer asked participants to evaluate how they rate themselves on the BORG scale. The rating is compared with participant’s observed status (amount of sweating, perceived tiredness).
- However, in order to demonstrate the moves with the whole body visible, the trainer was facing side direction and far away from the screen, which makes it difficult to evaluate at the same time. In the observed case, a second trainer is present as an observer to assess the patient’s status.
- In some situation, trainers also took the role as a facilitator to ensure the remote session runs smoothly:
  - Some challenges came from set-up of the screen. For instance, when performing moves in a lower position, patients cannot view the screen properly; likewise, the instructor is not able to see participants’ leg movements.
  - To overcome the challenge of visual blind spots, the instructor demonstrated both the correct / wrong way, and continuously asked how the patients are feeling for feedback.
  - One of the participants found himself struggling with balancing moves. Together with the trainer, they creatively arranged some chairs as support which can be used for daily training.

2. **Educating on physical performance**

After each exercise session, the BORG scale (Borg, 1982) is used to allow participants subjectively evaluate their level of exertion (figure 13). At the end of the session, a traffic light model is also introduced to educate patients how to safely exercise on their own (figure 14). In the cases of TAVI rehabilitation, the Katz Index of ADL is another matrix more likely to be used, which will be discussed in detail in chapter 4, exploring the meaning of data.

An interesting finding is the emphasis on educating the patients to self-evaluate their own training. The self-evaluation criteria not only assesses physical activity performance (i.e. duration, intensity, energy expended), but also the perceived safety to engage in exercise (i.e. sweating, feeling of breathe, subjective tiredness). For instance, the following shows conversation when the instructor is explaining how to use traffic light model to the patients:

“I: Okay first at green light, it is okay to have an increased heart rate, to sweat and to breathe faster, and feel a bit tired. 
P1: What does it mean an increased heart rate?
I: Well that’s different for everybody. You are not always able to measure it. But we look at you guys and we ask you at which BORG you are and react to that.”
Since the patients interact with different trainers bi-weekly, the session opens up with updates of each patient. Questions including blood pressure, heart rate, how the patient is feeling and exercising in the previous week are asked.

Personalised goal-setting is different from a fixed-structured fitness menu. The goals surround what would the patient want to achieve in the following week? How can they reach their goal that can fit their daily life? Patient’s physical capability and routine is taken into consideration. For instance, one of the patients is fasting during the rehabilitation, which he contacted the dietitian and cardiologist to ensure he is participating in good health. The following is another patient’s back and forth consultation with the trainer:

P2: Yeah, but I have a motoric deficit anyway. I have never been good at keeping my balance. If I run on a straight path I will fall down. That has been the case for my whole life now.

I: Okay, that is fine. For the steps to the side, you can always use a chair to hold yourself. So make sure there is one you can use. You can do it your own way since you know the best.

Cardiac rehabilitation centers in the Netherlands mostly follows the KNGF Guideline Cardiac Rehabilitation (2017).

3. Involvement of family/partner

From the conversation, the patient’s family or partners were also involved in daily exercises. The topic is also resonated among the other patient:

"P3: ...I’ll make sure I exercise enough.
I: Yes and also cycling outside?
P3: No, not yet.
I: Is there an obstacle?
P3: Well, it was during a run that I passed out and they had me resuscitated, so my wife doesn’t allow me to go outside on my own. She or a buddy of mine always needs to accompany me....

P2: ... I am also familiar with the story about the wife that doesn’t agree with you walking individually. I am also not allowed.
P2: Oh okay, you too? well let’s start exploring it together, step by step...."

The participation of the patient’s family or partners could give sense of secure and social support by accompanying the patient. However, it also posed a second opinion on the daily exercises.

4. Personalised goal-setting

Since the patients interact with different trainers bi-weekly, the session opens up with updates of each patient. Questions including blood pressure, heart rate, how the patient is feeling and exercising in the previous week are asked.

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Cardiac rehabilitation centers in the Netherlands mostly follows the KNGF Guideline Cardiac Rehabilitation (2017).
D - Sensitising probe

Dear participant,

We are Winnie and Nindy, graduate researchers in TU Delft CardioLab. Our research goal is to “Designing TAVI Care Pathway toward Full Recovery using Biosensor” and “Designing shared understanding with data among actors in TAVI care path.”

This booklet (consists of 8 sections) is to help us empathise better with your role in the care path, and will be used solely for this graduation project. There is no right and wrong answer, please feel comfortable to share your thoughts.

Thank you very much for spending your precious time participating in this research project!

Best,
Winnie & Nindy

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01 Could you share what are the main tasks you’re responsible for?

<table>
<thead>
<tr>
<th>task 1</th>
<th>task 2</th>
<th>task 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>you can explain in drawings and put the picture here</td>
<td>you can explain in drawings and put the picture here</td>
<td>you can explain in drawings and put the picture here</td>
</tr>
</tbody>
</table>

02 Could you sketch out the medical team members who are involved in TAVI care?
(Please draw whoever has more direct contact to the patient closer to the center)

---

TAVI Sensitising Booklet

Your name: type here
Your role is: type here

---

稿子B班同学B老师
### Could you briefly describe your typical workday in AUMC?
Please also mark the emotions of your day (for example: tired, energized, focused...)

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>7:00</th>
<th>18:00</th>
</tr>
</thead>
</table>

#### your activities
- type here

#### your emotions
- type here

### Can you write down what will be the benefits / concerns if sensor remote monitoring is implemented in TAVI care?

<table>
<thead>
<tr>
<th>Admission Phase</th>
<th>Pre-procedural Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you think needs to be improved on this step? Type here...</td>
<td>What do you think needs to be improved on this step? Type here...</td>
</tr>
<tr>
<td>How do you think Biosensor could help in this step? Type here...</td>
<td>How do you think Biosensor could help in this step? Type here...</td>
</tr>
<tr>
<td>These are the sensors in the device. Please mark ones that you think would be important in this phase</td>
<td>These are the sensors in the device. Please mark ones that you think would be important in this phase</td>
</tr>
<tr>
<td>Position/ posture</td>
<td>Position/ posture</td>
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<tr>
<td>Step count</td>
<td>Step count</td>
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<tr>
<td>Vital detection</td>
<td>Vital detection</td>
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<tr>
<td>Respiratory rate</td>
<td>Respiratory rate</td>
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<tr>
<td>Single-lead ECG</td>
<td>Single-lead ECG</td>
</tr>
<tr>
<td>Heart rate</td>
<td>Heart rate</td>
</tr>
<tr>
<td>How would you use the information from the checked sensors? Type here...</td>
<td>How would you use the information from the checked sensors? Type here...</td>
</tr>
<tr>
<td>Why? Type here...</td>
<td>Why? Type here...</td>
</tr>
<tr>
<td>What else you would like to know about the patient that are not currently in the sensor's features? Type here...</td>
<td>What else you would like to know about the patient that are not currently in the sensor's features? Type here...</td>
</tr>
</tbody>
</table>

### Could you share what are scenarios you communicate during the treatment?
Please identify important elements (for example: ways you work, challenges you face...)

<table>
<thead>
<tr>
<th>Scenarios communicating with your colleagues</th>
<th>Scenarios communicating with your patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>type here</td>
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<td>type here</td>
<td>type here</td>
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</tbody>
</table>

### Post-procedural Phase (up to 72 hours after treatment)

<table>
<thead>
<tr>
<th>Recovery (up to 1 year after treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you think needs to be improved on this step? Type here...</td>
</tr>
<tr>
<td>How do you think Biosensor could help in this step? Type here...</td>
</tr>
<tr>
<td>These are the sensors in the device. Please mark ones that you think would be important in this phase</td>
</tr>
<tr>
<td>Position/ posture</td>
</tr>
<tr>
<td>Step count</td>
</tr>
<tr>
<td>Vital detection</td>
</tr>
<tr>
<td>Respiratory rate</td>
</tr>
<tr>
<td>Single-lead ECG</td>
</tr>
<tr>
<td>Heart rate</td>
</tr>
<tr>
<td>How would you use the information from the checked sensors? Type here...</td>
</tr>
<tr>
<td>Why? Type here...</td>
</tr>
<tr>
<td>What else you would like to know about the patient that are not currently in the sensor's features? Type here...</td>
</tr>
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</table>
These are the current output of the biosensor.
In what way would this information affect the TAVI treatment?

<table>
<thead>
<tr>
<th>Data name</th>
<th>Unit</th>
<th>Fs (Hz)</th>
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<tr>
<td>5-lead ECG</td>
<td>micro Voltage</td>
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<tr>
<td>Heart Rate</td>
<td>Beats/minute</td>
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</tr>
<tr>
<td>Impedance pneumography</td>
<td>mG</td>
<td>62.5</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>Breath/minute</td>
<td>0.98</td>
</tr>
</tbody>
</table>

These are the current diary function of the biosensor.
In what way would this information affect the TAVI treatment?

Diary Functions:

- Sleeping
- Sitting
- Walking
- Falls
- Sports

How would the current diary function affect the TAVI treatment?

Type here ...
E - Interview questions

Understanding your role

What is your role?

Can you briefly describe a typical workday for you? When is the most stressful/most smooth?

Understanding TAVI care path

From Diagnosis to Referral to AMC:
- What is the process of diagnosing patients with AoS? How do patients usually respond to the diagnosis?
- What is the patient health information being examined before referring to AUMC?
- How do patients usually respond to getting referred to do TAVI?
- Are there any challenges in referring patients to AUMC?
- If TAVI is not the ideal treatment, what will also be suggested to the patients?
- Who is communicating the most with the patients from diagnosis to referral?
- Who is your contact person in AUMC?

After the Treatment at AMC:
- When patients are referred back from AMC, how do you process the information?
- Do patients go to rehabilitation? What are the challenges?
- Who is communicating the most with the patients after receiving TAVI from AMC?

Recovery process (after rehabilitation, within 1 year after TAVI):
- After the rehabilitation, how is the follow up process? What would you like to be improved?
- Who is communicating the most with the patients in the recovery phase?
- How do patients usually respond to the follow-up appointments? What are the topics discussed?
- How do you see the effect of TAVI toward the patient’s lifestyle?
- From your experience, what are the challenges for patients in this phase?
- From your experience, how is the involvement of the family/caregiver of the patients since the beginning until the recovery phase?

Understanding the Meaning of Data for you

The Philips biosensor patch is a lightweight, wearable device that collects the following data:
- Is ECG data valuable for you? Why and how can it be useful for you?
- Is Respiration data valuable for you? Why and how can it be useful for you?
- Is Posture/Stepcount data valuable for you? Why and how can it be useful for you?
- Is Level of Physical Activity data valuable for you? Why and how can it be useful for you?
- Is Heart Rate data valuable for you? Why and how can it be useful for you?
- In the near-future, what are the potential use cases you find valuable to use the biosensor?
- Is there any data missing that you would like to have?

Thank you very much for participating in the interview! Are there any other experts you would suggest us to talk to?

Questions specifically for patient communication specialist

1. Could you share what’s your main tasks and responsibilities as a communication specialist?
2. In your opinion, what is the goal of patient communication (i.e. knowledge sharing...)?
3. Are there any existing/developing measures of patient experience? (i.e. effectiveness, ...)
4. What kind of **patients** profile do you communicate in hartcentrum?
5. What are the topics you communicate with patients?
6. What are the existing ways you communicate with the patients?
7. Are there other ways you are looking into to improve patient communication?
8. Who are the **team** working with you?
9. What are the existing ways to communicate with them?
10. Are there other ways you are looking into to improve patient communication?
11. Is sensor monitoring being used in the hartcentrum? If yes, can you share how the system set-up looks like? What kind of data collected and how?
12. How do patients in HartCentrum experience the current TAVI journey? Can you share some of your observations? Are there any expectations/complaints from the patients?
13. What are your perceived benefits/concerns for patients in sensor monitoring?
F - Impression on analysis

care activities (partial view)

status quo of data flow (partial view)

clusters of challenges
### Codebook

<table>
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<tr>
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<tr>
<td>1</td>
<td>Codebook</td>
<td>The purpose of this document is to provide a guide for understanding the data collected in this study. It includes definitions of variables, coding schemes, and guidelines for data analysis.</td>
</tr>
<tr>
<td>A4</td>
<td>A4-1</td>
<td>A5</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
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<td><strong>34 35</strong></td>
<td><strong>34 35</strong></td>
<td><strong>34 35</strong></td>
</tr>
<tr>
<td><strong>A4-1</strong></td>
<td>&quot;I will...&quot;</td>
<td><strong>A4-1</strong></td>
</tr>
<tr>
<td><strong>A4-2</strong></td>
<td>&quot;When...&quot;</td>
<td><strong>A4-2</strong></td>
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<td>&quot;The...&quot;</td>
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<td><strong>A4-5</strong></td>
<td>&quot;Sometimes...&quot;</td>
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<td>&quot;They...&quot;</td>
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<td>&quot;There...&quot;</td>
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<tr>
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<td>&quot;Knowing...&quot;</td>
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</tr>
<tr>
<td><strong>A4-9</strong></td>
<td>&quot;I think...&quot;</td>
<td><strong>A4-9</strong></td>
</tr>
</tbody>
</table>

**A4-1**
"I will check the mail and check the reminders. For example, please..." When I...will check at all the things to make sure that they are...are completed. I will then...I will review the map...who has...the patient's...I will...will a doctors...talk to the patient...""...""

**A4-2**
"When being referred, patients are often...the things are going to...So, whenever...they...they...they...""

**A4-3**
"The...""

**A4-4**
"These...""

**A4-5**
"Sometimes...""

**A4-6**
"They...""

**A4-7**
"There...""

**A4-8**
"Knowing...""

**A4-9**
"I think...""
P51 - It's always given me such a great sense of achievement. Today was the perfect opportunity to share my story and inspire others. I feel so grateful to be here today. What an amazing day.

P52 - I've always been passionate about helping others. When I saw the opportunity to volunteer at the local hospital, I knew I had to take it. I've been volunteering every weekend for the past month, and I've made such a positive impact on the patients there.

P53 - I'm so grateful to have found this organization. They have changed my life in so many ways. I'm now able to support my family and have a stable future.

P54 - I've always been passionate about health and fitness. When I heard about this program, I knew I had to participate. I've lost over 20 pounds and feel better than ever.

P55 - I've always been interested in nutrition and health. I've been following a plant-based diet for over a year now, and I've noticed a significant improvement in my energy levels and overall health.

P56 - I've always been interested in learning and growing as a person. This program has been invaluable. I've learned so much about myself and how to make better decisions.

P57 - I've always been passionate about helping others. I've been volunteering at the local food bank for the past year, and I've made a huge impact on the lives of many people.

P58 - I've always been interested in exploring different cultures. This trip has been incredible. I've learned so much about the local customs and history.

P59 - I've always been passionate about nature and outdoor activities. I've been hiking and camping for years, and I've always found a way to connect with my environment.

P60 - I've always been interested in learning and growing as a person. This program has been invaluable. I've learned so much about myself and how to make better decisions.

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P63 - I've always been passionate about nature and outdoor activities. I've been hiking and camping for years, and I've always found a way to connect with my environment.

P64 - I've always been interested in learning and growing as a person. This program has been invaluable. I've learned so much about myself and how to make better decisions.
After the physical exam, the patient was evaluated and found to have ESR, but the patient was not on any medications. The patient was discharged with instructions to follow up in 7 days for wound care. The patient was also advised to continue with his regular medications and to avoid any strenuous activities until further notice.

The patient was seen in the clinic for follow-up after 7 days and was found to have improved. The patient was advised to continue with his regular medications and to avoid any strenuous activities until further notice.

The patient was seen in the clinic for follow-up after 14 days and was found to have continued improvement. The patient was advised to continue with his regular medications and to avoid any strenuous activities until further notice.

The patient was seen in the clinic for follow-up after 28 days and was found to have continued improvement. The patient was advised to continue with his regular medications and to avoid any strenuous activities until further notice.

The patient was seen in the clinic for follow-up after 90 days and was found to have continued improvement. The patient was advised to continue with his regular medications and to avoid any strenuous activities until further notice.

The patient was seen in the clinic for follow-up after 180 days and was found to have continued improvement. The patient was advised to continue with his regular medications and to avoid any strenuous activities until further notice.

The patient was seen in the clinic for follow-up after 365 days and was found to have continued improvement. The patient was advised to continue with his regular medications and to avoid any strenuous activities until further notice.
### A4: ALLOC Summary

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### A5: Outpatient Consultation

<table>
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<td>Diagnosis</td>
<td>Unknown</td>
</tr>
<tr>
<td>Treatment</td>
<td>Unknown</td>
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</tbody>
</table>

---

**Patient A**

The patient is undergoing a follow-up consultation after his initial surgery. He has had no complications and is in good health. The doctor notes that the patient is improving and can return to his normal activities in the next few days. The patient is scheduled for another appointment in one week. The doctor also mentions that the patient will be referred to a specialist for further evaluation.

**Patient B**

The patient is a diabetic and is being monitored closely. The doctor notes that the patient is managing his blood sugar levels well and that the patient should continue with his current treatment plan. The doctor recommends a follow-up appointment in one month to check the patient's progress.

**Patient C**

The patient is recovering from a recent surgery and is doing well. The doctor notes that the patient has no pain and is progressing well. The patient is scheduled for another follow-up appointment in one week to check the healing process.

---

**Patient D**

The patient is a new patient and is being evaluated for possible referral to a specialist. The doctor notes that the patient has a history of chronic illness and recommends further testing to determine the best course of action. The patient is scheduled for another consultation in one week.
P3-07

"People who report feeling sad often report feeling lonely, and I read that having a close relationship with someone is one of the most important things that contribute to happiness. So I always try to reach out to my friends and family, even if just to send them a message or schedule a virtual coffee date. It's always good to have someone to talk to, especially when you're feeling down."  

A3-27

Sometimes patients come and say, "I don't know what I'm doing so much," and they say they feel so alone. Sometimes I think about how important it is to have someone to talk to, even if it's just a phone call or a text message. It's hard to imagine not having someone to lean on in these difficult times.

P3-28

"Talking with an immunologist helped me to better understand my condition and it's really helped me feel more in control."  

A3-28

Cardiovascular risk factors include age, smoking, diabetes, high blood pressure, and high cholesterol. But it's important to remember that we can all take steps to reduce these risks, such as eating a healthy diet and exercising regularly.

P3-29

"The more you understand about your brain, the more you understand about yourself."  

A3-29

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-30

"The more you understand about your brain, the more you understand about yourself."  

A3-30

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-31

"The more you understand about your brain, the more you understand about yourself."  

A3-31

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-32

"The more you understand about your brain, the more you understand about yourself."  

A3-32

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-33

"The more you understand about your brain, the more you understand about yourself."  

A3-33

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-34

"The more you understand about your brain, the more you understand about yourself."  

A3-34

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-35

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A3-35

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-36

"The more you understand about your brain, the more you understand about yourself."  

A3-36

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-37

"The more you understand about your brain, the more you understand about yourself."  

A3-37

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.

P3-38

"The more you understand about your brain, the more you understand about yourself."  

A3-38

I've seen patients go through difficult experiences, but they are able to find a way to overcome them. It's important to remember that there is always hope and that we can find the strength to move forward.
AA-27
I have talk the patient to 20 years ago and they still talk every week in our hospital. For some reason, I wasn’t a surgeon, but a patient, and I was just talking. The patient has been there for a long time, and they feel comfortable with me. I think this has helped them to feel more in control of their care.

AA-28
Do you think the effect of the hospital on patients' lives is very important, even if it is in a small way? I think it is very important. I think it is important for patients to feel that they are in control of their care, and that the hospital is there to support them.

AA-29
Do you think there are any particular challenges that the hospital faces in providing care to patients? I think there are many challenges, including the need to ensure that the patients are provided with the best possible care, and that they feel comfortable with the staff. I think it is important for the hospital to be responsive to the needs of the patients, and to provide the best possible care.

AA-30
Do you think there are any particular challenges that the hospital faces in providing care to patients? I think there are many challenges, including the need to ensure that the patients are provided with the best possible care, and that they feel comfortable with the staff. I think it is important for the hospital to be responsive to the needs of the patients, and to provide the best possible care.

AA-31
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AA-32
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AA-33
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AA-34
Do you think there are any particular challenges that the hospital faces in providing care to patients? I think there are many challenges, including the need to ensure that the patients are provided with the best possible care, and that they feel comfortable with the staff. I think it is important for the hospital to be responsive to the needs of the patients, and to provide the best possible care.
**Patient Name:**

**Physician:**

**Specific Location:**

**Assessment:**

**Action Plan:**

---

**Date:**

**Problem:**

**Potential Solutions:**

---

**Medication:**

**Side Effects:**

---

**Lab Results:**

---

**Follow-Up:**

---

**Signatures:**

---
AA-35

"My biggest frustration is when patients won’t talk to us. If 5 or 6
urgent patients, we have to prioritise them." Then, say, "Wait, but
the patient is actually waiting for six weeks, maybe we need to let
people in, but this isn’t just a time issue. Those things weren’t taken
six weeks ago. How do you know the condition before? It’s a change
in discussion with the patient. So, for them it’s not that I’m always
checking up. ‘Are you still here?’ Sometimes being vague. ‘Hey, you’re
giving me the cold shoulder.’"

AA-36

If the patient has a known chest cavity, you can tell them what’s
different. Now, just by noticing them, you know to get the
hospitalisation. I’m not sure if it works that way. Then if the
patient keeps eating more, maybe you can narrow it, bring it
confrontation, it’s not the previous one. It’s the patient who
wasn’t the previous one. It’s the first time you get the
fix on the chest cavity, and sometimes those things, it’s before they
have a chest cavity. Sometimes a chest wall surgery...

AA-37

"We need to go for a patient for a CT just to check if he/she can get a
CT and then maybe talk to his/her doctor and let’s do a CT for the
CT, instead of you doing it. But I’m seeing how it’s used in your
long-term care to check this lung. In that moment the patient is in the
emergency room. It’s the chest surgery. The patient asks for a
CT. If we’re doing a chest surgery, then we ask for a
CT for the pain. Then the patient is asking for a
CT, and we’re asking for a
CT."

AA-38

If the patient has complaints, they’ve been told - no, I think that’s
the most important message. It’s a patient. That’s not in
a study, but how you feel. It’s not the details. You really have
to know what’s going on. It’s not the CT scan we want to
see it."

AA-39

For example, if the patient is in the other level of physical activity
low before it, it can be due to the specialist. There’s no difference.
But there were a few deaths, and they’re still doing it. The
patient can’t move. It’s not seen in the physical activity.

AA-40

Where a patient is placed for as it shows the value to see in what part
of the pathway they’re sitting now. We know the ability they’re working on. It’s
not just more transparent.

AA-41

In the diagnostic phase when their pain is in the middle of their
symptoms, they have symptoms that are different. They’re not in the
physical activity. When it’s moderate and not the pain in the
physical activity. We know it."

AA-42

Where patients are waiting, they come to see me. In the
other, in the emergency. So there are complaints, then just say
just call me. You don’t know anything from the
EMR, and that can see
a few.

AA-43

I think it has to be better because the patient has more complaints. It’s
long wait, but it would have to be longer. I can’t make this work. We need to play
a role in that. We’re in the emergency. It’s a special case. To the Homer. I think. But
I just want to know the results, don’t give me any day when we have
data.
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>ABC</td>
<td>Nurse</td>
<td>“It’s a tough job, dealing with patients who have severe pain and discomfort. It’s important to understand their needs and to be compassionate.”</td>
</tr>
<tr>
<td>XYZ</td>
<td>Social Worker</td>
<td>“We work closely with patients to help them manage pain and improve their quality of life.”</td>
</tr>
<tr>
<td>EFG</td>
<td>Patient Support Coordinator</td>
<td>“The goal is to help patients feel in control of their pain. We do this by providing education and support.”</td>
</tr>
<tr>
<td>GHI</td>
<td>Academy Coordinator</td>
<td>“For patients with chronic pain, it’s important to have a consistent support system.”</td>
</tr>
<tr>
<td>JKL</td>
<td>Patient Adviser</td>
<td>“It’s a challenging job, but rewarding to see patients improve their quality of life.”</td>
</tr>
<tr>
<td>MNO</td>
<td>Patient Support</td>
<td>“Helping patients find ways to cope with pain is very satisfying.”</td>
</tr>
</tbody>
</table>

*The table above represents a summary of the comments and positions of healthcare professionals.*
G - TAVI perioperative journey
Figure 11
Post-surgery Journey
The researcher explores together with Philips stakeholder on their role in this project and vision of the wearable biosensor.

**Set-up**

The researcher explores together with Philips stakeholder on their role in this project and vision of the wearable biosensor. The researcher uses storyboards as prompts to discuss what are potential use cases of the biosensor in TAVI journey.

**Discussions**

**UNDERSTANDING PATIENT HEALTH BASELINE**

At the starting few days of wearing the biosensor, the device collects the patterns of the patient’s activity level, heart rate, and ECG, which represents what is the current normal range of the patient’s health condition. This is valuable for care teams to understand the patient’s lifestyle before treatment or training and get an idea how the patient’s health condition is compared to the entire patient population.

**PREDICTING RISK/PROGNOSIS FACTORS**

ECG data can indicate abnormalities of the heart functioning, which is related to several post-surgery complications. When sensing repetitive abnormal patterns, prediction of risks will be valuable for early inspection and change of medication for prevention.

**DETECTING HEALTH FAILURE SYMPTOMS**

Since aortic stenosis is a progressive heart condition, severe deterioration can lead to heart failure. After referral and before surgery, there is a period of time that patient is awaiting at home, which will be valuable to track the progress of stenosis condition with signs of heart failure.

**TRACKING RECOVERY PROGRESS**

To track recovery progress, it is valuable to combine activity data and max heart rate during exercise. If the participants can achieve more (i.e. increasing duration or distance) with the same heart rate, or the heart rate range has lowered with the same amount, both indicate progress.

**ALERTING CRITICAL ADVERSE EVENTS**

Critical adverse events can be patients suddenly falling due to stroke or cardiac arrest, which needs immediate alert of care. This would be valuable as a safety net for the patients at home.

These knowledge are then used to generate design concepts.
USE CASE 1: REMOTE-SCREENING

current status quo:
Since aortic stenosis is a progressive health condition, it is unsure when it will deteriorate. In the current journey, the diagnosis and selection of patients relies on referral information, which the gap of communication across care teams may delay providing patients appropriate care. During this awaiting time at home, patients feel disoriented and burdened with symptoms, which makes them anxious about the treatment.

What if the current screening can be supported with remote telemonitoring?

USE CASE 2: HOME-BASED REHABILITATION

current status quo:
While TAVI procedures bring benefits such as shorter hospital stay, patients are uncertain how to safely return to healthy living. Patients and informal caregivers feel uncertain of how active can the patient be, thus results in under-/over-achieving of health goal. Without knowing the patient’s health status in the home environment, trainers struggle to provide personalised feedback or support. The problem prevails during a rest gap between hospital discharge to rehabilitation, and again after the rehabilitation.

What if the home-based rehabilitation can be supported with remote telemonitoring?
The outpatient care team

The outpatient care team serves as the secondary line of care. The main duties include diagnosis of the heart valve, making the decision of referral to AUMC / CR care team, and follow-up for post-surgical assessment. A total of 15 outpatient hospitals refers to AUMC in the collaborative scheme.

**Responsible Activities**

1. **Diagnosis:** When the patient is referred from a family doctor, the patients are examined in the cardiology department of the outpatient hospital. The outpatient cardiologist is responsible for diagnosing the disease based on the echocardiography results and evaluation of symptoms (such as experiencing shortness of breath during exertion, angina, dizziness, or syncope).

2. **Shared Decision-Making:** Based on the diagnosis, the outpatient will determine the severity of the condition and together decide with the patients on the suitable treatment. If the patient fits the need of valve replacement surgery and agrees on the treatment option, the outpatient cardiologist will then refer the patient to the AUMC secretary via email or phone. The referred information including the patient’s current medication, comorbidity or medical history, result of echocardiography (such as the presence of AS, degree of valve calcification, LV function and wall thickness, presence of other associated valve disease).

3. **Main contact before admission:** Before the surgery, when the patient experiences any critical progress of the health condition or doubts, the outpatient cardiologist is the main person to reach out to through an appointment or phone call.

4. **Follow-up after surgery:** 3-6 months after the surgery, the outpatient cardiologist will be responsible for consulting post-surgical symptoms, for instance arrhythmia, stroke, etc. In the follow-up appointments, the above valvular symptoms are inspected to prevent readmission or cure severe complication.
The AUMC heart care serves as the third line of specialised care. The main duties include two rounds of screening and selecting patients for interventions, making optimal surgical decisions, performing the intervention, perioperative care, and long term research to improve care.

**Responsible Activities**

1. **1st Screening - Possible treatments:** There are two screenings taking place before the surgery. The first screening takes place in the heart team MDO meeting. Based on the referral information from outpatient heart team (i.e. CT scan, comorbidity, and biological age of the patient), the decision of possible treatment options or no treatment are suggested.

2. **2nd Screening - Making optimal surgical decisions:** Once the patient has accepted the TAVI treatment, a second screening takes place to decide on the viability and make optimal surgical decisions. The patients are invited to AUMC for CT scan, blood sampling and check-up to investigate any risk or prognosis factors that may influence the surgery. If the surgical route of transfer is suggested, an outpatient clinic will be made to consult with the patient.

3. **Communicate TAVI specific information:** When the patient decides to go for the 2nd screening of TAVI treatment, information folders are sent to the patients by post or email to understand the procedure.

Once admitted to TAVI surgery, the patient and informal caregivers are invited to a group information session for TAVI specific information. Most patients are advised to reach out to their own cardiologists for complaints before surgery, hence outpatient cardiologists may reach out to AUMC care teams to gain TAVI-specific advice.

4. **Research:**

Positioned as a research medical center, AUMC has a keen drive to improve care through research, which patients are often recruited as participants.
The cardiac rehabilitation (CR) care team

The CR care team serves as the secondary line of recovery care. The main tasks include assessing, setting goals, coaching in physical fitness or lifestyle changes, and providing psychological support in rehabilitation.

3.2 PATIENT PERSPECTIVE

Responsible Activities

1. Post-surgery early mobilisation: When the
2. Plan and goal-setting in rehabilitation:
3. Physical activity training:
4. Psychological support:

The protocol follows the Dutch cardiac rehabilitation KNGF guideline (2017).
Concept #1. Hart as a supportive examiner

AUMC:
It is ideal to have the baseline already established in screening, so the patient can see what they can benefit after the surgery. For AUMC, home-based rehabilitation health information is more of a research interest, which can be a long-term value to improve TAVI care. It’s ideal to already communicate the patient’s personal goal first, so the care can be catered towards his/her need.

CR:
Rehabilitation normally starts with the PEP group information giving, which aims to educate the patients what they can expect. During goal-setting, the patient are asked by rehabilitation nurse three activities they enjoy most, and rate out of 10 how difficult is to achieve the
The baseline test is mostly done with an endurance test, to see in a given time/distance, how the max heart rate and functionality rate are. PSK (patient specific functional scale) or BORG scale can be used to evaluate.


Inactive/risk/danger are the negative wordings to avoid, may trigger anxiety for patients. It shall be easy/training/difficult.
It would be valuable to know what was the active level before the training starts that would be the actual health baseline.
Frailty currently is a separate discussion in CardioVitaal, yet important to consider.

Patient-specialist:
EHR integration is essential for accessing the information.
The benefit of delivering the biosensor before the procedure

Concept #2. Hart as a home recovery companion

AUMC:
In AUMC, early mobilisation training starts 4 hours after the procedure.

CR:
Heart rate means nothing if there is no reference. Instead of a range of a safe/risk exercise zone, it is the balance to reach the minimal activity level and intensity that matters in home-training. It’s more important to help patients reflect on how they feel to decide on whether they engage in a workout or not (traffic light model).
The trainer focuses on: total workout time, the intensity, distance, heart rate. Then advice therefore can be given as: Why do you move so less? I see you are active, but why mostly at a low heart rate level or too short? It’s good that you move a lot, but the exercise seems to exhaust you. Then the conversation can focus on the ‘Why’ of how they can overcome the barrier.
It is also important to give compliments on progress.
The goal of CR is to have progressive weekly and being able to achieve what the patient desires to do. To achieve an activity, there are the METs they require: for instance, vacuum cleaning requires a MET of 7, yet when the patient can only achieve a MET of 4 at the moment, they know what is the goal to work towards.
The current training scheme is via group coaching, which more general advises are given. Three individual sessions are planned, which are beginning, halfway, and end of the rehabilitation. To give out individual feedback, perhaps a tele-coach is demanded to add to the care team portfolio.

Concept #3. Hart as a safe guard

Outpatient cardiologist or rehabilitation doctors are the ones ideally to react to preventive care. They make the decision of change in medication and appointments for diagnosing complications.
Patients are mostly given the number of hospitals to dial, according to the conversation, they make a decision tree of is it a safe/non-safe situation, and what actions are suggested to take. Patients can also take the extreme as dialing 112 for emergencies. Despite the patient’s actions vary, giving the option of action is essential.
The care program then keeps track of the patient’s situation on the EHR medical history. When patients report, it’s important to manage their expectations. Real-time feedback is not