Design For Workflow Intelligence In Cardiology
Prompt User Liaison Service Experience system

Master Thesis Appendix by Hao Liu

TU Delft

PHILIPS
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Appendix A

IDE Master Graduation
Project team, Procedural checks and personal Project brief

This document contains the agreements made 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, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks.

- The student defines the team, what he/she is going to do and deliver and how that will come about.
- SSC-EESA (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.

PROCEDURAL CHECKS

To be filled in by the chair of the supervisory team. The postgraduate program will be checked for a 2nd time just before the green light meeting.

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

name: __________________________ date: - - - - - signature: __________________________

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, fill in your assessment and sign this Project Brief, by using the criteria below:

- Does the project fit within the IV4G programme of the student taking into account, if described, the activities done next to the obligatory MSc specific content?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be double within 100 working days/20 weeks?
- Does the composition of the supervisory team comply with the regulations and fit the assignment?

name: __________________________ date: - - - - - signature: __________________________

IDE TU Delft - EBSA Department // Graduation project brief & study overview // 2018-01-v0

Page 1 of 7

Initial & Name: - Lu
Student number: 4734211
Title of Project: Workflow Orchestration in Cardiology
Workflow Orchestration in Cardiology

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 01 - 04 - 2019 end date 13 - 08 - 2019

INTRODUCTION

Please describe, the context of your project, and address the main stakeholders involved within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural, social, economic, resources, time, money, technology, ...)?

Healthcare is rapidly changing. Hospitals and care providers are being held more and more accountable for their performance. Not only for the quality of care, but also for reduction of costs, and improving the patient and staff experience. The need for design in healthcare has gained numerous concerns due to the fact that hospitals have been paying special attention to patient/staff journey, hospital experience. But the need for design and user experience has not fully seeped into hospital culture, and it often hasn’t been clearly articulated at the highest levels of these organizations (McCuddy, 2016). The author would like to highlight the importance of design for healthcare and to advocate medical institutes taking practical actions in this manner.

In Cardiology, cardiovascular disease now heads the World Health Organization list of biggest killers in the world and is rapidly increasing in prevalence. On the face of it, cardiovascular disease should be ideal for developing innovative models of care that will both improve the well-being of the population and the sustainability of their healthcare systems (Phillips, 2019). On the other hand, cardiology staff, amongst other medical specialists, have reported evidence of burnout. A survey showed that 13% of cardiology experienced depression as well as burnout. Among those who reported depression, one-third stated that they were more easily exacerbated by patients (31%) or less engaged with them (26%) as a result of their depression. Interactions with colleagues and medical staff are also affected (ESC, 2018). “Doctors are reporting that they are spending more and more time dealing with computers and documents, and less time interacting with their patients and practising medicine”.

Healthcare is on a mission to innovate. Artificial and augmented intelligence are driving the future of healthcare. According to Peter Fitzgerald, MD, PhD, the unique challenges that are occurring as information technology collides with healthcare technology were seen as the most exciting thing that has happened in medicine (Young, 2019).

Reference:


The implementation of digital tools in healthcare has transformed cardiology in hospitals towards a digital and intelligent hospital service system. However, there has been an issue on the interaction between the medical staff and the digital tools and while they engage with those digital tools. The questions are firstly, the technology acceptance of the medical staff on how to solve their needs and lower the barrier for usage. Secondly, the technological literacy of the medical staff on how to support both tech savvy digital natives and non-digital natives of the medical staff in using those digital tools. And thirdly, the overload and repetition of information they receive from various tools, on how to support medical professionals to interact more efficiently and effectively with those digital tools. The factors mentioned above would be fit in the context within several selected medical institutes in the Netherlands.

The design researcher will analyze decision making and planning of the cardiology staff while they engage with digital tools in the cardiology department, and identify key problems and bottlenecks of the interaction with digital tools. The expected deliverables are a summary illustrating the boundaries of a system of engagement to work. A working design concept, a report including research, process, strategic suggestions for this product service offering.

The design researcher will investigate the existing interaction of working with digital tools between the cardiology staff in several medical institutes in The Netherlands, and create concepts and value propositions for potential solutions for the next 3-5 years.

Philips offers smart solutions worldwide in the cardiology department for the medical staff. The implementation of AI in several services, e.g. smart alerts, checklists, scheduling, clinical dashboards, are giving the empowerment for the medical staff to be able to do their work more efficiently and flexibly. All of which contributes to the increasing efficiency and flexibility of the medical staff, and therefore optimizes their workflow. In order to solve the problems mentioned in the problem definition section, an ideal solution with a working concept is expected.

The project agenda consists of 4 design phases in a period of 20 weeks.

The first phase, the research phase, would start from studying literature about company culture and getting to familiarize a hospital context. The internal interview is necessary for the designer to acknowledge other colleagues’ expertise and to understand how they can contribute to be in help with the project. The observation section holds the major part of this research phase, and it is the preliminary task before conducting interviews. The designer would observe how the cardiology staff work in a hospital context, then come up with the interview plan based on the insights gathered from observation. The expected outcome from observation are 1) to understand the communication between the medical staff in the communication with patients, 2) to identify their emotional status in the work process, 3) to study their interactions while engaging with medical devices; 4) to study their usage behaviour of mobile devices.

The second phase starts from implementing the Contextmapping methodology. The aim of doing this method is to study the user’s behaviour and then come up with initial design principles for the concept. The designer would ask the participants to notice on their work, which is to have them reflect on their work by mapping out their journey of their workplace. This can help the users in identifying their “good and bad” moments during their work, which gives the designer room for deciding on the elements of design. Initial design principles and ideas will emerge during the analysis of the interview. This would be the input for the co-creation session, where several stakeholders will be gathered together aligning with each other and brainstorming for ideas.

The third phase is about analysis and concept generation. By analyzing data from the co-creation session, the designer will narrow the focus of the design principles and ideas from the initial ones. Prototypes are expected to be build and iterate, also cross-verify with the stakeholders.

Lastly, the concept development and pilot phase is about finalizing the design and pilot the concept through hospitals and staff experience. The goal of the pilot is to validate the match between user needs and the design concept.
MOTIVATION AND PERSONAL AMBITIONS
Explaining why you set up this project, what competences you want to prove and learn. For example, acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed.

Optional: describe which personal learning ambition 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. Stick to no more than five ambitions.

During the time I visited back to my hometown last year, I realised how important health matters to my family. I have experienced lots of twists and turns around my family regarding health. This thought of feeling drove me to use my skills as a designer and my empathy as a family member, to make their lives better and healthier. In order to do so, I have also realised that it is necessary to look into the healthcare system in having more holistic insights. In my opinion, healthcare needs designers’ involvement. And looking at our world, we can already see designers that are trying hard to tackle healthcare challenges, most of which could not be easily done by healthcare professionals themselves. Therefore, I would like to highlight the importance of design for healthcare and to advocate medical institutes taking practical actions in this manner.

I first encountered a project related to healthcare on a course which we designed a launch strategy for Philips MyHealth Journey venture’s personal health record service platform. It was not until the project ended did I realise the lack of knowledge I have in the healthcare segment. I would develop in-depth knowledge and skills required in a medical context in this project. As for my ambition in mastering design methodologies, I would develop qualitative interviewing and analysing skills by experimenting context mapping, in practice where I studied the context mapping skill course.

Last but not least, working with an external company for a project is challenging but also exciting. I will be having the greatest opportunity to collaborate with healthcare professionals, scientists, business developers, etc. in a large corporate. Furthermore, I hope to bring my knowledge in design to the people I will be working with. This can be achieved by sharing and demonstrating the way of thinking and working with one another. Most importantly, for personal ambition, is to construct a path for a future career in healthcare. This project is the stepping stone to achieve my goal.

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

Appendix D

Background of the user visit

The purpose of the visit is to collect valuable insights and feedback of the workflow in the cardiology department for ideas in design principles of a design concept.

Participants:
- Hao Liu (TU Delft master student, Philips graduate intern)

Goal:
Philips is dedicated to embrace the need of caregivers. The "System of engagement" connects and interprets patient data from various sources to support caregivers with relevant insights at the point of care. To proactively suggests actions and prepares decisions in real time, based on actual patient data, guidelines and rules defined by the hospital staff themselves. The system might present realtime alerts, checklists or schedule changes based on the actual situation in the hospital.

I want to learn how to support cardiology caregivers in your interaction with digital tools (alerts, checklists, schedule, etc.), and identify your pain points and opportunities for improvements.

Outcome:
Outcome of this observation would be a service blueprint for caregivers, to serve as:
- An overview of your workflow journey
- An overview of where digital tools is used in your current workflow
- Ideas for the digital tools, and opportunities for improvement (e.g. proposals)

What to expect after this visit:
- I will organize an interactive workshop, to further discuss on co-creating ideas and solutions for future digital tools.

Approach:
We’d like to do observations throughout the cardiology department. Observations include small interviews in between, on the base of not interrupting you and your colleagues too much.

The whole process would take approximately half day from start. And if possible, I would like to have discussions with other stakeholders (~2-3) in your department with whom you would work together on improvement.

Example interviewee’s roles:
Cardiac Nurse
Cardiologist
Scheduler
Cathlab team lead
Biomedical Services / Technical dept / IT dept (people responsible for e.g. phone systems, smartphones, people that would know the user requirements)

Typical questions could be:
- Can you show me the digital tools that you use?
- How often do you have to interact with digital tools, e.g. Alerts, checklist? What digital tools do you recognize? What are the “stupid” tools that help you perform these activities.
- How often do you interact with digital tools daily?
- How do you feel when you interact with each tool currently on a realtime basis? E.g. Current products (e.g. patient monitoring), IT systems (e.g. EMR, scheduling), communication systems (phones, smartphones, pagers), computer systems (ipad, laptop, desktop PC, in-room fixed screen)
- How are they made context-aware/realtime (e.g. barcodes/QR codes)?
- What annoys you when you interact with these digital tools?
- What delights you when you interact with these digital tools?
- What are typical requirements for these tools above, related to your user experience?
- What do you like and/or dislike about any digital tools? How would you work without a digital tool?
- Do you always use this particular tool, or do you take alternatives in case of some emergencies?
- What kind of improvements do you feel that the digital tools bring to you (efficiency, flexibility, ease, precision, etc.), compare to traditional tools that you used?
- Do other people in your team influence the way you interact with these digital tools?

Hao Liu
MSc. Strategic Product Design

TU Delft
Appendix E

Assessment - Diagnosis

Appointment
Lab Tests
Collect patient data

Cath Lab

Ward
Diagnosis - Treatment Planning
Decide treatment plan
Risks
Patient order / priorities
Find timeslot

Treatment - Aftercare
Patient reminder
Arrival at ward for surgery
Prepare procedure
Confirm diagnosis
Confirm treatment decision
Appendix G

**Storyboard 1**

**Scenario 1: Nursing department [with Resident Doctor X and Ward Nurse Y]**

1. At 8 am, in the staff room, ward nurse Y does verbal reporting with the night shift nurses, and discuss with other morning shift nurses which patients she wants to take care of today, then writes down patient name and ID in her note. One nurse is late, so nurse Y has to keep a paper note for her.

2. At 9 am, resident doctor X starts the shift by talking with the morning shift nurses who carry their notes, to discuss about patient situation. Nurse Y only knows that Dr. X is the one who she's going to work with when she sees him the doctors’ schedule rotates a lot. Dr. X writes down on his own notes from the conversation. He requests a blood test for a new patient #015, and agrees to discharge patient #020, nurse Y notes down on her own notes, as a task list.

3. After the morning briefing, Dr. X goes to the whiteboard and see nurses including nurse Y are on duty for clinical rounds with him. Nurse Y goes and checks on the nursing report about her patients documented by the nurses from previous shifts. The only information she wants to know is the patient name, medical history, and the reason for admittance. Nurse Y then requests for the blood test from the blood taking department.

4. Dr. X then goes to the desktop, check on his email, where he sees a reminder from his supervisor that he has to find a time slot that every doctor is available for a group meeting. However, he can hardly find a good time slot that suits everyone. Nurse Y also checks on her email, sees a reminder from her team leader about information in several medication updates she has to keep in mind.

5. Dr. X then opens the patient EMR file, and searches for the lab result he asked for in the morning. However, the result is not ready because it is not in the patient file yet. Dr. X can only then look at every other patient's file he's responsible for, and prepares a list of problems to solve in his own notes or by head.

Nurse Y starts the care for her patients. She notes down patient’s weighing, fluid intake and output on paper. She gives medication to her patients once in a while depending on the protocol, and notes down the next medication is in 7 hours.

6. At 11 am, Dr. X starts clinical rounds with nurse Y and other nurses he works with. He focuses on talking with patients #012 to #030, writes down notes on each and every patient in his own notes or by memorizing. Ideally, Dr. X would tell nurse Y what to do and immediately give prescriptions for it. However, after the rounds, Dr. X has to prepare for the meeting so he left without giving verbal orders to the nurses.

**Heuristic evaluation 1:**

1. At 8 am, morning shift nurses check in by scanning badge. PULSE shows in one big screen in the staff room: all ward patients/new patients and morning shift nurses. Night shift nurses explain patient situation with morning shift nurses in front of the big screen. Ward nurse Y chooses patient #002 #003 #004 #015 #020 ... by dragging patients cards to her card. The nurse who is late will be assigned patients by other morning shift nurses. As soon as the nurse arrives at the hospital, they can see their patients in PULSE. PULSE shows that Dr. X will be present today based on the synced schedule of everys staff. Nurse Y knows how to interact with Dr. X before he comes so she can be prepared for the morning briefing.

2. At 9am, Dr. X arrives, scans his badge to a nearby desktop. PULSE knows Dr. X is active, all morning shift nurses knows the morning briefing is starting soon by a notification from PULSE. In the staff room, PULSE shows on the big screen with, ward patient cards: patient name, patient ID, ECG, kidney function, lab test results; for new patients cards (in different color): patient name, patient ID, reason for admittance, ECG, kidney function, lab test results, patient history. Dr. X orders patient priority by dragging patient cards in PULSE.

3. During conversation, Dr. X orders patient priority by dragging patient cards in PULSE. Nurse Y adds a new task (blood test for patient #015) in PULSE, she sets it to priority. Dr. X agrees to discharge patient #020, he marks patient #020 as “discharge” in PULSE, nurse Y immediately sees the discharge mark on her patient #020 in PULSE.

4. Dr. X logs in the desktop with his badge. PULSE shows: he is in the process of morning briefing to clinical rounds; The nurse list he works with; Bubble with numbers of unread emails; Bubble with numbers of unread messages. Dr. X sends a meeting request to everyone in PULSE, the ones who overlap their schedule will be asked by PULSE if they can adjust their agenda. Nurse Y logs in the desktop with her badge. PULSE shows: her patient cards with - patient name, medical history, reason for admittance (from the nursing report); Bubbles with numbers of unread emails and messages. Nurse Y adds to the medication tab so whenever a patient has the updated medication, PULSE pops-up a reminder, for 3 days.

5. Dr. X will get a pop-up saying the blood test is ready and a new bubble with new lab results. Dr. X could add his own tasks or problems to solve in PULSE based on his patients. For instance...

6. Nurse Y does her rounds and types in patients’ weighing, fluid intake and output in PULSE in her mobile phone or the cow. PULSE reminds nurse Y to give an IV to patient # 002 and medication (with reminder of the medication update) to patient #004.

7. At 11 am, Dr. X and nurses including nurse Y gets a notification from PULSE, to prepare for clinical rounds. PULSE reminds Dr. X to give verbal orders and prescriptions to nurse Y after seeing all patients so that nurse Y could keep as tasks in PULSE.

**Storyboard 2**

**Scenario 2: Cath lab [with Interventional Cardiologist X, lab nurse Y and CCU nurse Z]**

1. At 3pm, at the CCU, an emergency alarm rings and shows on desktop. CCU nurse Z looks into patient vital signs sent by email (via lifenet) from the ambulance staff. Nurse Z then calls the ambulance to ask for specific patient information and writes them down on a checklist. Nurse Z misspelled the patient name because of unclear pronunciation from the ambulance staff. So nurse Z checks on the EMR system and she finds the wrong patient file.

2. After finally confirming to the right patient, and know the patient has a myocardial infarction from the ambulance, nurse Z calls the cath lab. However, the only phone number of the cath lab is often occupied. Nurse Z has to call 3 times until someone from the cath lab answers. The cath lab calls Cardiologist X and lab nurse Y to prepare for the PCI procedure.

3. The patient has arrived at the CCU being taken care of by nurse Z.

4. Cardiologist X is still on his way.

5. Nurse Y is in cath lab room #2 preparing the table and setting up devices.

6. After nurse Y finishes preparation, he calls the CCU to bring the patient down to the cath lab. Nurse Z brings the patient to the cath lab. Nurse Z wants to make sure from nurse Z what medication and how much did the ambulance staff use on the patient, nurse Z could not answer because she did not record it, her checklist does not have the information.

7. After the procedure, it ends 30 minutes earlier than planned. Cardiologist X sees there is enough time to treat another patient in between the next procedure. He goes to the cath lab control room and ask the secretary to plan in another patient in this free time space. The secretary then calls the responsible physician to ask if the physician can do his procedure now.
Appendix H – Nursing Department

Morning briefing → Check staff → Look into patient data
  (EMR) → Collect lab results → Make an overview of the problem
  → Initiate nurse check → Clinical rounds → Write down findings
  → Talk with supervisor → Prepare for evening briefing

Morning shift: Virtual report → Morning briefing → Morning self update → Check staff → Check on patients → Start patient care → Clinical rounds → Continue patient care → Prepare for evening briefing

Nursing Department

Appendix: Design for workflow intelligence in Cardiology
Prepare patient list

Be prepared for patient

Call for patient

Patient Inquiry

Consulting and advising

Finalise reporting

Supervision

Appendix: Design for workflow intelligence in Cardiology

Outpatient Clinic

Doctor prepares patient list with patients they are going to see beforehand.

Technicians will be visited by a doctor if the test results of a patient are not sent to the patient EMR system.

Secretary

The secretary accesses the patient at the beginning of the care process. They would confirm the patient’s arrival and input patient data into the patient EMR system.

The secretary will ensure that the patient is called for the appointment once the doctor has arrived.

Patient inquiry

Doctor inquiry

Finalise reporting

Preparing the patient list

Be prepared for patient

Calling the patient

Patient inquiry

Patient arrival

Doctor arrival

Finalise reporting

Outpatient clinic doctor is the last person a patient sees after all the tests are done.

Doctor prepares patient list with patients they are going to see beforehand.

Doctor checks on the cardiac patient file for echos, ECGs that are taken before the patient sees the doctor. They make sure they get the lab results before seeing a patient.

Doctor would start entering data once the test results are ready.

Doctor asks the questions standardised from the St. Louis network.

Doctor retrieves medication used from the pharmacy via the LSP network.

The outpatient clinic doctor is the last person a patient sees after all the tests are done.

Doctor prepares a printout sheet with patients they are going to see beforehand.

Doctor can see from the desktop whether the patient has arrived at the waiting room.

Patient will be called in the waiting room screen once the doctor announces the patient with a click on the desktop.

Doctors have only 15-20 minutes for each patient.

Doctor starts by asking standard questions to the patient and documents them to the patient’s file.

- If there is a cardiac problem
- If there is subclavian
- Palpitations (irregular heartbeat)
- Dizziness
- Hypertension from medication
- Allergies
- Asthma
- Sleep problems
- Smoking
- Drinking
- Drugs
- Complaints
- Any other questions from the patient

Doctor explains lab test figures to the patient and gives advice and suggestions on behavioral changes for the patient.

Doctors finalise the report for each patient.

Doctors send the final report to additional caregivers by mail.

Young doctors would send the final report to their responsible supervisors.

Patient list

Call for patient

Patient inquiry

Finalise reporting

Preparing the patient list

Be prepared for patient

Calling the patient

Patient inquiry

Patient arrival

Doctor arrival

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Appendix: Design for workflow intelligence in Cardiology

Cath Lab

Catheterization Laboratory

Prepare case → Be prepared for patient → Begin procedure → Treatment → Confirm treatment success → Finalise treatment report

Doctor checks the agenda for tomorrow mostly in the night before. And checks if the schedule is doable.

Doctor reviews the patient file, looks up the context of the patient.
- Who is the patient
- Gender / age
- Co-morbidities
- Risks

Doctor gets the call from the ward nurse and then shows up.

Doctor views the patient EMR file at the control room.

Doctor verbally reads out the actions made, the amount of medication used, to the ward nurse in the control room via speaker.

Doctor looks at the monitor with information of:
- ECG
- Hemodynamics
- File function
- Blood pressure
- O2 loss
- Heart rate
- Patient data

Doctor executes the treatment process.

*A temporary stop moment where the physician calls for support from other physician.

Doctor calls for the lab nurse from the control room to reach out to other physician who are available for a discussion on a complex practice. The physician leaves the operating room to the control room, meet with other physician and discuss on the treatment.

Doctor finalize the treatment.

Lab nurse writes down who the patient is when they arrive earlier than the cath lab.

Lab nurse takes over patient from ambulance staff.

Lab nurse writes down later.

Lab nurse talks to the patient at the end of the day/whole treatment.

Lab nurse makes sure the medical equipments are ready and functioning (connects ECG), and gets the medication ready.

Lab nurse calls the doctor by desk phone indicating the patient is ready.

Opens up the patient EMR file. Start filling out content, ticking boxes.

Lab nurse speaks the lines from the physician and logs the procedure detailing the time, description of the procedure, and the figures within the procedure.

Lab nurse enters the operating room to the control room, to assist the physician or getting the machines ready.

Lab nurse immediately dials to reach out to other physician who is available for a discussion with the physician.

Lab nurse notes down the procedure report of this incident.

Lab nurse asks the nursing department to send people to get the patient back to the ward for recovery and follow-up.

Lab nurse asks the administration to send the materials to the patient back to the ward.

Lab nurse calls the patient to start the medical devices.

Log procedure details

Announce the physician

Assist the physician

Call out for extra consultation (optional)

Log procedure details

Hand over & cleaning

Check materials

Prepare staff and patient list → Prepare patient → Receive procedure details from physician → Log procedure details

Lab nurse takes over patient from the ambulance staff, brings in what they say about the patient, double check on:
- Date of birth
- Allergies
- Medication: Ox-Ca, Clpido
- Risks

Lab nurse takes over patient and the names of each personnel.

Lab nurse writes down the patients are for tomorrow and who are the staff that will be present tomorrow, on a whiteboard. They check the computer for the schedule and written notes from a notebook.

Whiteboard1: Room numbers of the cath lab and the patients to see for each room and the scheduled time.

Whiteboard2: The nurse shift, when to expect the staff and the names of each personnel.

When it’s busy, write down the procedure, medication on a piece of paper on the wall, and then type them down later.

Lab nurse transfer patient back to the CCU for stabilisation.

Lab nurse gives the report when all patients are seen and treated.

Lab nurse sends the report to their supervisor at the end of the day.
Delivers patient to the cath lab.
Describe patient information to the doctor and log the procedures.
Transfer patient to the CCU if you are the staff that will be doing the surgery.

**Ambulance staff**

- Lab nurse transfer patient back to the ward. Announce the patient for recovery and support from other physician.
- Lab nurse log time when the physician sends the report to their email. Most of the tasks are done properly.
- Lab nurse transfer the patient to the cath lab.
- Lab nurse gets annoyed when they don’t know where the physician is, even if they called. And this is because the patient is already been waiting on the bed for a long time.
- Lab nurse sometimes forget to log the procedure because they are busy doing something else. They would remember to log it back to the system but it is a hassle.
- Lab nurse logs the timestamp of the procedure base on “get feeling”.
- Lab nurse sometimes forget to log the procedure because they are busy doing something else. They would remember to log it back to the system but it is a hassle.
- Lab nurse logs the timestamp of the procedure base on “get feeling”.
- Lab nurse does not know which other doctor is available when the physician calls out for a discussion.
- Now everything gets sent by email. Most of the tasks are discussed during meetings or directly to one another. Sometimes they are forgotten, and the team leaders have to remind them to check if certain tasks are done properly.

**Vision**

A digital dashboard with information connected and accessible through devices.
Access to the database of staff positions, real-time location. Know the availability of the resources in an emergency. An overview of patient situation that helps the doctor to determine patient urgency.

**Requirements**

- A digital dashboard showing the procedure for the physician. Data of items is needed to train an algorithm.
- Lab nurse transfer the patient to the cath lab.
- Lab nurse gets annoyed when they don’t know where the physician is, even if they called. And this is because the patient is already been waiting on the bed for a long time.
- Lab nurse sometimes forget to log the procedure because they are busy doing something else. They would remember to log it back to the system but it is a hassle.
- Lab nurse logs the timestamp of the procedure base on “get feeling”.
- Lab nurse does not know which other doctor is available when the physician calls out for a discussion.
- Now everything gets sent by email. Most of the tasks are discussed during meetings or directly to one another. Sometimes they are forgotten, and the team leaders have to remind them to check if certain tasks are done properly.

**Ideas**

-默契: A digital dashboard showing the procedure for the physician. Data of items is needed to train an algorithm.
- Lab nurse transfer the patient to the cath lab.
- Lab nurse gets annoyed when they don’t know where the physician is, even if they called. And this is because the patient is already been waiting on the bed for a long time.
- Lab nurse sometimes forget to log the procedure because they are busy doing something else. They would remember to log it back to the system but it is a hassle.
- Lab nurse logs the timestamp of the procedure base on “get feeling”.
- Lab nurse does not know which other doctor is available when the physician calls out for a discussion.
- Now everything gets sent by email. Most of the tasks are discussed during meetings or directly to one another. Sometimes they are forgotten, and the team leaders have to remind them to check if certain tasks are done properly.

**Painpoints**

- The ward nurses should be doing actual meaningful things rather than documenting the procedure.
Appendix I

Start of A Day

Understand patients earlier and clear

- No instant overview for the doctors to know what has happened to patients last night. Only the nurses knew
- Want to understand patient status right away and be prepared for the patients at the beginning of a day.

To be reminded of their own tasks and plans

- No instant overview of the problems from the days while the user was not in duty.
- Want to have an interface that shows vividly the problems from the previous weekend from other colleagues while the user was not in duty, to help them keep in mind

- User sets goals at the beginning of a week, e.g., notes taken when meeting with their supervisor or work towards releasing patient X in 7 days. There is no instant overview on the plans the user has made for a week. 10 days, or a month, they have to scroll down to find it somewhere. The key moments with the supervisors and patients are important because that determines the care process. The plan is what a clinician sticks to throughout the period.
- Want to have a screen that shows vividly the week plan of a user, get reminders, “and maybe a “progress bar”
- Nice for starting physicians

Hassle-free, intuitive way of interacting with HIT systems

- It is a lot of hassle to fill in lots of stuff in an EMR manually.
  The staff needs all information filled out automatically in an EMR at the right time at the right place
  The clinician needs the input to be easily filled in the EMR, and to have the latest data of a patient available.

- The intuitiveness between Chipsoft (EMR system) and EPD (Cardiology specific) is bad in a way that a lot of repetitive actions should be made

- Need seamless engagement with writing briefs (reports) from HiX to EPD, wants intuitive user experience and user interface

- Demands for free beds and availabilities for free spaces are not well communicated
- Want the information of free beds and spaces sent to the cardiac emergency room in a dynamic situation

Receive information at the right time

- The staff are not triggered to proactively check for new updates or news that are new to them and they should know about.
- They need a system that pushes messages about updates or news at the right time.

- Doctors are waiting for new lab results in front of their computer, and it sometimes takes hours to get the result.
- Want to be notified by a notification when there is a new lab test result coming.

Use waiting time wisely

- A lot of waiting time for a staff because preparing a patient and waiting for lab results are time-consuming
- They want to utilize the waiting time for patients/lab results more wisely

On Duty

End of A Day

- No instant overview for the weekend doctors to know what their tasks are
- Need to keep a log of incomplete tasks at the end of a work week, for the weekend doctors to have an overview on their tasks.

- The degree of happiness from an interventional cardiologist decreases throughout a day. Improvements can be made
- They want to feel positive at the end of a long day work.
A lot of times a clinician would not know if other staff has received the messages correctly.

Want to confirm and be notified if other stakeholders who need to know the updated information are well informed.

The clinician envisions that the future device for communication can certainly be mobile phones, tablets, and wearables.

The way how the staff communicate about changes in their schedule or agenda has to be improved.

They need a better way to communicate the change in schedules and agendas.

In nursing departments, 70% decisions are made by doctors, 30% are by nurses in general. The nurses usually makes the decision to release a patient.

Need patients who are well to check out as soon as possible.

Currently the problems a patient has is written down in paper or by memorizing during clinical rounds, then make the problems more structured afterwards. Then recollect data and file it to the EPD.

Want to see down the problems the patients have during clinical rounds in a more automated way.

They really like to talk with patients verbally in during clinical rounds.

Less time spent in reporting and delays means more time can be spent in building relationships with the staff and the patient.

They need the patients to be prepared on time, and they need a better and integrated system to support them in reporting.

No instant overview for the doctors to know what happened to patients last night. Only the nurses know.

Want to understand patient status right away and be prepared for the patients at the beginning of a day.

It is very important for them to get the latest updates of patients, they get upset and annoyed if there is no data before everything starts at the beginning of a day.

Want a head start for a day, get up-to-date information/data, problems of patients (ward patients and new patients) Data: lab tests, ECG, kidney function (Kidney function is critical for cardiologists because a lot of medication used diminishes kidney function of a patient)

Want to have an overview that lists all the problems of the patients for a day as a start. Could use paper notes, IPad...

No instant overview for the weekend doctors to know what their tasks are.

Need to keep a log of incomplete tasks at the end of a work week, for the weekend doctors to have an overview on their tasks.

It is a lot of hassle to fill in lots of stuff in an EMR manually.

The staff needs all information filled out automatically in an EMR at the right time in the right place.

The clinician needs the input to be easily filled in the EMR, and to have the latest data of a patient available.

Less time spent in reporting and delays means more time can be spent in building relationships with the staff and the patient.

They need the patients to be prepared on time, and they need a better and integrated system to support them in reporting.
To be proactive to interact with passive information and reduce information overload.

Nurse 1

Where: Staff room - Nursing Department
Who: Morning shift doctor & morning shift nurses
What: 08:00 Morning briefing

Nurse 2

Where: Staff room - Nursing Department
Who: Morning shift doctor & morning shift nurses
What: 09:00 Morning briefing

Nurse 3

Where: Staff room - Nursing Department
Who: Morning shift doctor & morning shift nurses
What: 08:00 Verbal reporting

Nurse 4

Where: Staff room - Nursing Department
Who: Morning shift doctor & morning shift nurses
What: 08:00 Verbal reporting

Nurse 5

Where: Staff room - Nursing Department
Who: Morning shift doctor & morning shift nurses
What: 08:00 Verbal reporting

End User - Doctor

End User - Nurse

MS Nurse 1

MS Nurse 2

MS Nurse 3

MS Nurse 4

MS Nurse 5

Cath Lab Nurses (Patient)

Cath Lab Nurses (Phone)

Cath Lab Nurses (Other)

Appendix J

Design for workflow intelligence in Cardiology

Service Blueprint

Workflow Orchestration in Cardiology

Nursing Department & Cath lab - per shift

45
Appendix / Design for workflow intelligence in Cardiology
Some content pages of the student's original content, part of the final project report. To be shared for feedback.

Key Requirements

Touchpoints

To specify the agency of these patients throughout the design process.

To include the flow of data exchange in a seamless and representational way, patients' data in digital formats, e.g., documents, data in patients' medical record, and access information pathways.

To design a process in line with patients' information in digital formats and processes.

To specify the agency of these patients throughout the design process.

To include the flow of data exchange in a seamless and representational way, patients' data in digital formats, e.g., documents, data in patients' medical record, and access information pathways.

To design a process in line with patients' information in digital formats and processes.
To support automated and accurate support in decision-making

1. ECG
2. Blood test
3. Aspirin

System reads the signal from the badge scanner. Then sends notification to the objectives.

System reads the signal from the badge scanner. Then sends notification to the objectives.

System syncs with the calendar of a user.

Calculates the remaining time.

For the sake of convenience, please always inform me of patients who are treated on my ward. I am limited to a certain extent by the fact that I cannot directly contact the patients. It is therefore necessary to pass on the necessary information to the relevant parties.

Now when I open the nursing report, including things I do not need to know is there!

We only want to know: patient name; patient medical history; emergency plan; medical rules and regulations; current problems and their treatment; medication; etc.

I will be able to provide a more accurate diagnosis and treatment plan for patients in the future. It is therefore necessary to pass on the relevant information to the relevant parties.

Aspirin has changed. Now for patient #015 I will take care of room 1 (#002, #003, #004, #015, #020).

I have been informed of the request and will take care of the patient's needs. I will inform the patient about this.

Now I will be able to read emails on Outlook.

Task 4

Complete

Group meeting, room 4B

Bring patient #009 to Cath lab.

'Group meeting, room 4B

Bring patient #009 to Cath lab.'
I have to request blood test for patient #015 from the blood lab tests.

Nurse 4

Nurse 2

ECG Date of birth

Reason for admittance

Patient #019

Name

Date of birth

Reason for admittance

Patient #011

Name

Date of birth

Reason for admittance

Patient #010

Name

Date of birth

Reason for admittance

Patient #020

Name

Date of birth

Reason for admittance

Patient #023

Name

Date of birth

Reason for admittance

Patient #009

Name

Date of birth

Reason for admittance

Patient #073

Name

Date of birth

Reason for admittance

Patient #010

Name

Date of birth

Reason for admittance

Patient #011

Name

Date of birth

Reason for admittance

Patient #019

Name

Date of birth

Reason for admittance

Patient #015

Name

Date of birth

Reason for admittance
We only want to know: patient name; patient medical history; lab tests; fluid output; possible letters from a GP about a specific patient.

Instead, MS doctor looks at patient EMR and makes himself a list of problems he has to solve for his patients. In an ideal situation, MS doctor would directly give verbal reporting to morning shift nurses. We only want to keep the way they use those systems, e.g., EMR systems. Let the staff who are trained to use their current system to keep the way they use those systems.

Let the Cardiologist to know Cardiologist 1 will be performing the procedure 30 minutes earlier than planned. Let the Cardiologist to know he works with.

To have control over their working habits, with a small learning curve to operate and manage a new system. We only want to have accessible and usable data with high mobility.

If it would be great have this kind of flexibility. To ask MS nurse 4 about her rooms. Utilize the productivity of the cath lab to its fullest. Block timeslot Cath Lab 1 Cath Lab 2 Cath Lab 3 Cath Lab 4.

Prepare for Cath lab procedure Know patient #010 has a PCI scheduled at 14:00. Help bringing patient #010 to the cath lab for MS nurse 2. Stop doctor left for his meeting. “Do I have to do something about it?”

Prepare for Cath lab procedure Accept Patient #009 to cath lab. Send patient #009 to cath lab. Estimation end time 15:20. Start doctor is a control on computer but...
### Appendix L – Key quotes

<table>
<thead>
<tr>
<th>Statement</th>
<th>Evidence</th>
</tr>
</thead>
</table>
| 1. Clinicians are trained well enough to handle such emergency cases that there is no need for a system to tell them what to do. | “When emergencies happen in wards, someone presses a button, sounds the alarm. Then whoever can help will gather.” -- Ward nurse  
“It will be great if a system supports us and shouldn’t give us more work. Because if something goes wrong, we can handle it. We don’t need a system to tell us what to do because that’s our job.” -- Ward nurse & Cath lab nurse |
| 2. A system could not easily detect if something is wrong with a cardiac patient. Mostly the clinicians would notice the problem based on their experience and their own ‘feeling’. | “Bleeding emergencies do not easily get noticed because blood pressure gets higher if its bleeding, but the medication is to keep the blood pressure low.” -- Ward nurse  
“There’s no rationality behind those variations, it’s something you feel, see, hear, sense. Even though the patient’s condition is completely normal, we can feel that something is not right.” -- Doctor |
| 3. There is no time to check on mobile devices or computers if one is handling an emergency case and needs immediate help. It works better to have all nurses who have also done verbal reporting (kind of knows the condition of every other patient) to come and plan the next steps together. | “We do a lot of transporting patients, so we’re not only at the rooms we take care of.” -- Ward nurse  
“If we have to send out a message to someone with a backstory, that will take us more time than just hitting a ‘I need help’ right now button.” -- Ward nurse  
“With voice recognition, that’s good, but sometimes we don’t know what’s going on yet.” -- Ward nurse |
| 4. In addition to being flexible on one’s own agenda, knowing other colleagues’ agenda affects greatly on the whole planning dynamics. With a shared schedule to check on the availability of other cath lab co-operators allows the leading nurses to plan things effectively. | “If I know that my colleagues are available to do the cases. And I know that they did not plan any meetings with other people, I know that I can plan something.” -- Interventional Cardiologist  
“I want to see what the activities of my colleagues are at that time. So if they are fully available at the lab, or if they also have meetings with external parties.” -- Interventional Cardiologist  
“If somebody else put something there that I get a notification that says there’s a conflict because your colleague also decided to plan a short meeting during their clinical activities with the suggestion of empty time slots where the other colleagues did not plan anything.” -- Interventional Cardiologist |
| 5. Digital planning system is crucial to Cardiologists/physicians in the cath lab than it is to the nurses or secretaries. Current planning systems in use are not considered practical to medical professionals in both academic and peripheral hospitals. | “Just have to hope that somebody else doesn’t have a lot of appointments on that day. Otherwise, it will pose a problem. And it actually poses problems, we do get issues from that, because the nurses complain that we all have to leave at the same moment.” -- Interventional Cardiologist  
“The core activities of the other professionals, like the nurses and the secretaries, they don’t have these other tasks as I do. Usually they’re not so committed to the type of agenda interaction in the way I do” -- Interventional Cardiologist  
“And at the end of every day, I always have the feeling that we could have done one or two, or maybe three procedures more, which would reduce the waiting list.” -- Interventional Cardiologist  
Why not Outlook?  
“I’m somewhere else. And I would have to go to a computer, open outlook, open the agenda of three to four of my colleagues. And that consumes a lot of time because Outlook is not a very practical program.” -- Interventional Cardiologist  
“I’m quite sure that non-educational hospitals have similar issues. I guess it goes for most medical specialists, they have these appointments in between, and to help them if they have something available that would aid in their planning.” -- Interventional Cardiologist  
[Graph]  
“I fill my day for when it concerns time for 80% with procedures, yes. And 20% of the time is available to do other stuff. Yes. But because there is no synchronization between the two, you end up with, from the activity point of view with 70% today, filling with clinical activities, and 15% of the time filling with other activities. And the rest of the time is just wasted time because the blanks are not synchronized.” -- Interventional Cardiologist |
<table>
<thead>
<tr>
<th>The visualization of patient data in one overview fosters <strong>physical engagement with the team</strong>, and at the same time being on the same page with the same knowledge so that the staff can easily help each other out when needed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“So what’s good about this design is that you see like a visual image of the patient because you see the patient head photo, you know, and you remind stuff because you have a visual aid. If somebody just blabber around, nobody is gonna listen. And now everybody dumbers in the back, thinking of just being present.” -- Doctor</td>
</tr>
<tr>
<td>“It would make so much, the usability would be immense. It will be very intuitive, but also very connected. And now you can see it right on the screen and say, this is what’s going on.” -- Cath lab nurse</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>It is good to keep in mind that a system should never add additional work to a staff, unless the call for help to a person or a department is unreachable at the moment. It is then necessary to <strong>take extra effort to get attention from others</strong> with the help of the system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I don’t think any nurse would ever take the time to do this. Because I think it will take more time to send tasks than just ask someone, and we see each other so often. It would be easier to just have a timeline, a to-do list for yourself.” -- Ward nurse</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In the context of the same working environment, the usability for the task-assign functionality and the internal messaging functionality has to shift to a cross-department and a cross-position normality instead of between colleagues who see each other every minute.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I think the only thing you could really use from this is that we give a notification saying we’re on our way. I think this would work better between wards than in one ward. And also for communicating with doctors.” -- Ward nurse</td>
</tr>
<tr>
<td>“There is little chance our staff would use this because people just scream over the fence. It could be useful in certain situations. We wouldn’t want to overwhelm my co-workers, we rather speak to them.” -- Cath lab nurse</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Add a timer next to the unchecked results. The time of ‘not checking’ the lab results should not be displayed on a static device which would be totally ignored by a user.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Notification for test results is great, because then you have automation. And it would be great to have a number of minutes that you didn't check it, because sometimes somethings wrong, and not to point your finger at anybody, but you can really get people’s attention if something’s wrong, or something that I really need to check because a patient is dying.” -- Doctor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The idea of <strong>blocking time slots</strong> should be a shifting of mindset towards a commitment of further actions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I think the only situation that would work is if there’s some kind of conversation plan, like bad news conversation that should just say, Okay, I'll be there for the next 30 minutes, don’t bother me.” -- Ward nurse</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The functionality of task distribution by a system in the event of emergencies should not be totally ignored by the user.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“If emergency happens to patients, we hardly ever use the computer, everything is just wearable.” -- Ward nurse</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A physician should have the autonomy to plan things themselves with the support of a system that gives suggestions to the physician.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I think the Cardiologist would do the planning himself because he knows the pacing. And he can make choices and final decisions accordingly. The system could make suggestions about what patients could be put in what time.” -- Cath lab nurse</td>
</tr>
<tr>
<td>“This could be a real game changer, a life changer, definitely.” -- Cath lab nurse</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The system should be an additional support, without adding extra workload to the staff, and is separated from their personal life and their work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“We use systems that we see a lot of flaws in and that we could have some more support from the system for our work, it shouldn't change your work, it should just help us a bit. So I think these plans are great.” -- Doctor</td>
</tr>
<tr>
<td>“It's diverted from my work and my personal things. Because we use our own phone for everything. So that works like a second thing you got to do and you want to have to focus on your work.” -- Doctor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All parties envisioning to have portable devices around their working environment. Sterility issues are not considered an important problem for the clinical staff. It is safe to implement such decisions in practice.</th>
</tr>
</thead>
<tbody>
<tr>
<td>“All our ambulances in this region have iPads, we think for other staff it’s great to have an iPad as well. The sterile issue is not a problem because you can put like foil on it. And we can put it in our pocket, or put it at the start of the rooms so we won’t have to carry it.” -- All</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“There is little chance our staff would use this because people just scream over the fence. It could be useful in certain situations. We wouldn’t want to overwhelm my co-workers, we rather speak to them.” -- Cath lab nurse</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>“What I would really like to see is an algorithm that says a patient is deteriorating, alert, watch out for this. That would be really cool, but that’s futuristic, maybe in 30 years.” -- Doctor</th>
</tr>
</thead>
</table>
Below you can find the links to each transcript in otter.ai

**Interview with resident Cardiology 1-1**
https://otter.ai/s/uSmt3fBA5Vg8eReEu7TxDQq

**Interview with resident Cardiology 1-2**
https://otter.ai/s/01kk3-FkTPud0HlgxCwZ7Q

**Interview with Cardiologist/Professor 1-1**
https://otter.ai/s/C7SQ9rBCTYuWy6cM6y8Qh

**Interview with Cardiologist/Professor 1-2**
https://otter.ai/s/rCP3X_f9sEiWf9d9w

**Interview with Cath Lab nurse**
https://otter.ai/s/G6lALjx2Qse-YbuRy0sGb

**Interview with ward nurse**
https://otter.ai/s/5FuDiWyGQMuAqREbUglH

**Interview with Cardiologist**
https://otter.ai/s/vPxdNsgTaKzo6K0_8Ncg

**Interview with Coronary Care Unit nurse**
https://otter.ai/s/729t1HewQ9up7HFlylPQ

**Co-creation workshop with Resident Cardiology, ward nurse and Cath lab nurse**
https://otter.ai/s/7wwt2WgYS3a-sI2OqIQa8G

**Co-creation workshop with Cardiologist**
https://otter.ai/s/QwTBWAVR0tR2xPdKfXw

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**Appendix M**

**Agenda 14:00-15:00 @LUMC**

**Participant:** Resident doctor, Ward nurse, Cath lab nurse

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explain the goal of this session [5 min]</strong></td>
<td>The goal of this session is to walk you through a ‘future’ scenario with you working at the nursing department and the cath lab with our design concept.</td>
</tr>
</tbody>
</table>
| **Step 1 [10 min]** | We will illustrate a current scenario from the nursing department and the cath lab with possible incidents based on your input from the interviews. This is to let you to ‘reflect’ on the current scenario we depicted.  
- Let me tell the story first based on my own interpretation, and because I'm solving this complex problem and don't have much clinical background, so please correct me afterwards.  
- Please write down your thoughts and questions on the post-its. We will go through them after. |
| **Step 2 [20 min]** | We will describe your underlying needs and requirements from what we see in this scenario.  
- Are you familiar with the needs and requirements?  
- Which ones do you think are the most important? -> rank & elaborate |
| **Step 3 [10 min]** | Then we will bring out our design concept with a story about how you can do things differently with our design concept in the future.  
- Please listen and critically comment if the concept solves the needs and requirements. And later I'll ask you to reflect on the concept.  
- Please don’t focus on the design details (shapes, colors), but how the requirements are addressed in the concept. |
| **Step 4 Discussion [35-50 min]** | Finally, we will encourage you to think about:  
- How would you do your work differently with our design concept?  
- How would you do your work differently without our design concept?  
- What added value do you think our design can bring to your work?  
  E.g., Increase meeting efficiency with 20% speed and 15% less amount of administrative work  
  Team building, shared decision making support  
- Compare to your current workflow, how can our design concept support you differently from your current work and in what way? |

---
Appendix N

Field Research Background - LUMC

The purpose of the visit is to collect valuable insights and feedback of the workflow in the cardiology department for ideas in design principles of a design concept.

Researcher:
- Hao Liu (TU Delft master student, Philips graduate intern)

Brief:
Philips is dedicated to embrace the need of caregivers. The “System of engagement” connects and interprets patient data from various sources to support caregivers with relevant insights at the point of care. To proactively suggests actions and prepares decisions in real time, based on actual patient data, guidelines and rules defined by the hospital staff themselves.

I want to learn how to support cardiology caregivers in your interaction and communication with staff members and IT systems. Identify your pain points and opportunities for future improvements.

Outcome:
Outcome of this observation would be a service blueprint for caregivers.

What to expect after this visit:
- We will organize an interactive workshop, to further discuss on co-creating ideas and solutions for future digital tools.

Approach:
I’d like to do observations throughout the cardiology department. Observations include small interviews in between, on the base of using the “fly on the wall” method.

The observation section will include video recording and written notes. Data including voice records and photos will be collected and processed to be used in a report. The report will be archived in the TU Delft repository and Philips.

Hao Liu
MSc. Strategic Product Design
Consent Form for [workflow orchestration LUMC]

Please tick the appropriate boxes

Taking part in the study

I have read and understood the study information dated [__/__/2019], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.

☐ ☐

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

☐ ☐

I understand that taking part in the study involves:
[For observation, information is recorded in audio and photo format with written notes]
[The audio recordings will be transcribed as texts and will be destroyed at the end of the research project]
[The photos taken will not include patients. Working staff may be involved, however, faces will be blurred. Photos will be deleted at the end of the research project]

☐ ☐

Use of the information in the study

I understand that information I provide will be used for [indigenous knowledge, reports, video]

☐ ☐

Future use and reuse of the information by others

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Signatures

Name of participant ____________________________
Signature ____________________________ Date ________

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

☐ ☐

Researcher name (printed) ____________________________
Signature ____________________________ Date ________

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Cover Design

Hao Liu
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