Human-centered design for teamwork

Creating actionable solutions for increasingly complex teamwork in healthcare

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COGNITIEF

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Creating actionable solutions for increasingly complex teamwork in healthcare

Teamwork in healthcare is challenged by increasing complexity due to ongoing specialization, innovative technology and the urge for growing patient participation. This article explains the basics of teamwork in healthcare and human-centered design methods and presents two examples how teamwork can be supported by human-centered design.

Martine de Bruijne and Marijke Melles

Teamwork in healthcare

Few industries match the scale of health care. In the Netherlands alone, yearly an estimated 69% of the population visits a general practitioner and 40% visits a medical specialist (CBS Statline, 2020). A single hospital visit requires collaboration among a multidisciplinary group of clinicians, administrative staff, patients, and their loved ones. Many patients pay multiple visits across different clinicians working in different organizations. Therefore, ineffective care coordination and the underlying suboptimal teamwork processes are a public health issue. Health care delivery systems exemplify complex organizations operating under high stakes in dynamic policy and regulatory environments. Thus, the coordination and delivery of safe, high-quality care demands reliable teamwork and collaboration within, as well as across, organizational, disciplinary, technical, and cultural boundaries. In the Netherlands, with a health care system among the most effective in Europe (OECD, 2017), the health burden and patient harm experienced due to unsafe care remains a challenge. There is ample evidence that effective teamwork is a key resource to maintain safe and effective patient care. Due to technological advancements, increasing specialisation and decentralization of healthcare, and the urge for growing patient involvement in care complexity is rapidly increasing, posing new challenges to healthcare teams (Manser, 2009). In this paper, we explain how human-centered design can support teamwork in healthcare. We provide theoretical principles and two examples of human-centered design for teamwork.

What is teamwork?

A team is an identifiable group of two or more people who work together towards a common goal (e.g., football teams, aviation teams and surgical teams). Where taskwork is limited to "the performance of specific tasks that team members need to complete in order to complete team goals", teamwork includes the "adaptive, dynamic, and episodic process that encompasses the thoughts, feelings, and behaviour among team members while they interact toward a common goal" (Salas, 2014). In the last decade significant progress has been made in describing and understanding teamwork behaviours that support safe and effective team performance in healthcare (Burtscher, 2011). These teamwork behaviours are supported by clinicians' non-technical skills: a combination of cognitive (e.g. situation awareness (Endsley, 1995), social (e.g. leadership) and self-regulation skills (e.g. stress and fatigue management) that complement knowledge and technical skills needed for safe and efficient care (Flin, 2008). Thus, human factors play a central role in task and team performance. Until recently, the main focus of teamwork in healthcare has been on acute care teams, working in emergency care, surgery or intensive care (Verbeek-van Noord, 2015; Kemper, 2014). Human factors science combined with medical science has led to effective training programs for acute care teams, which have become widely available. Also, tools to support teams, mainly directed at communicating and sharing information, have been developed. Examples are checklists for handovers, timeout procedures to prepare or evaluate operations and whiteboards to provide an overview to the whole team (de Vries, 2012, Romijn, 2016).

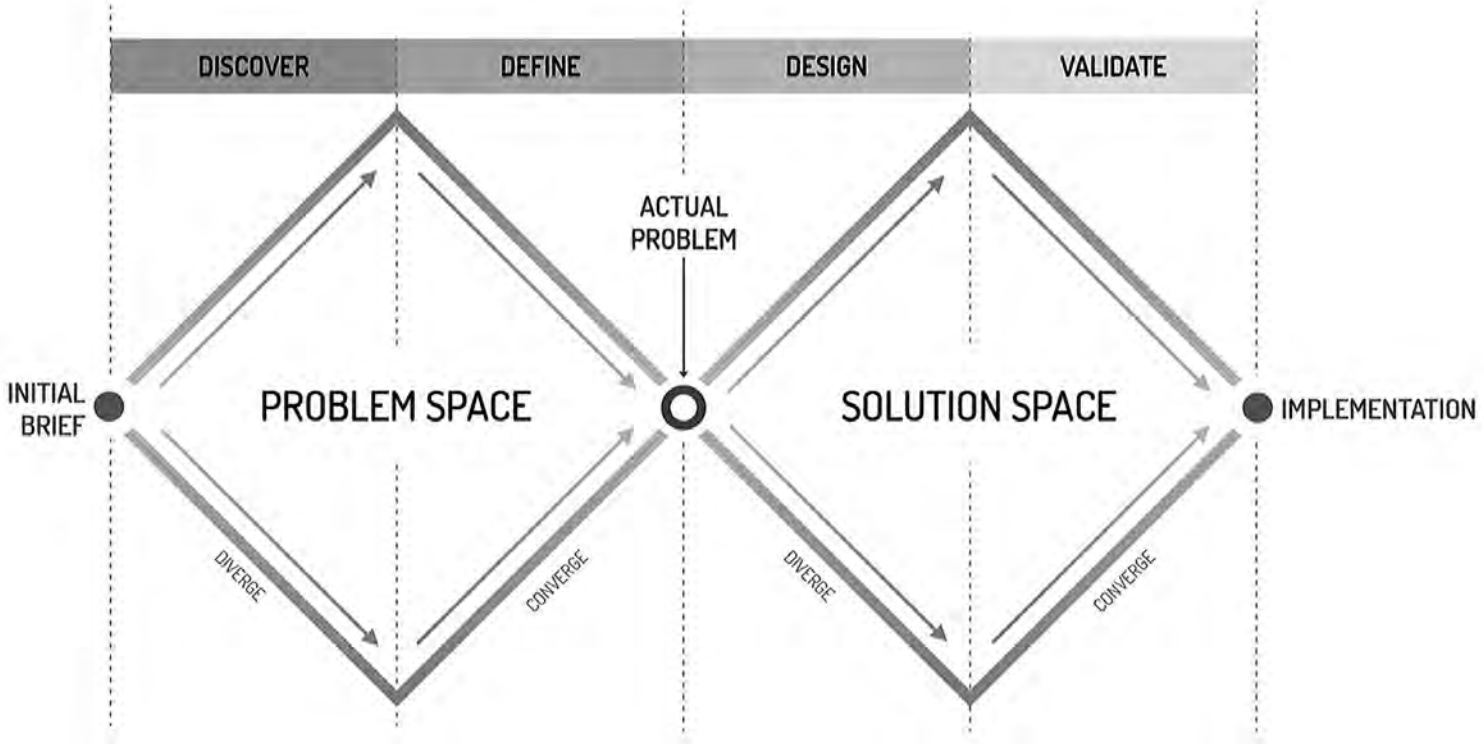


Figure 1. The Double Diamond Model (adapted from www.designcouncil.org.uk; see also Melles et al., 2021), visualizing the HCD process.

Challenges for healthcare teams

Modern healthcare is rapidly developing towards people-centred care, where individuals and their networks co-create their health (OECD, 2017; World Health Organization, 2016). This development requires patient involvement in teamwork, in which heterogeneous team members often work at different places at varying time intervals. For instance, patient portals to health records and tools for shared decision making have been developed to improve participation. Innovative medical technology is rapidly introduced to support medical tasks for professionals or patients, but may at the same time hamper teamwork. A well-known example is the surgical robot, which by design isolates the surgeon from the surgical team. As with acute care teams, at the start many of these new developments are dominated by medical science rather than human factors science. In order to optimize safety and effectiveness of the teamwork involved, medical innovations need to be complemented with human factors science, such as human-centered design (HCD).

Human-centered design

HCD revolves around understanding human needs, so as to design products or services that respond to these needs. Characteristic of HCD is its purpose-driven, participatory and systemic approach towards human needs, ensuring that solutions fit the dynamics of the (complex) socio-technical system the user is part of. Its three key principles include (1) developing a thorough understanding of people and their values, goals and needs; (2) engaging users and other relevant stakeholders from early on and throughout the design process; and (3) adopting a systems approach by systematically addressing interactions between the micro, meso and macro-levels of sociotechnical care systems (Melles et al., 2021). The HCD discipline is closely related to that of Human Factors (HF) and the terms are often used interchangeably (Dul et al., 2012). The HCD process roughly consists of two phases. In the first phase, the so-called problem space is investigated; what is the real underlying problem that needs to be addressed, what tasks do people have to or want to perform, what influence does the context have. In the second phase, the solution space is investigated; what solutions are possible and which solution is the most optimal. A widely-used visualization of the HCD process is the Double Diamond Model (see figure 1), developed in 2004 by the British Design Council. The double-phased model emphasizes the essence of HCD: first finding the right problem ('designing the right thing') and then fulfilling human needs by design ('designing things right'). The diamond structure affirms the divergent and convergent stages of the design process, referring to the different modes of design thinking; a process of exploring an issue more widely or deeply (divergent thinking) and then taking focused action (convergent thinking).

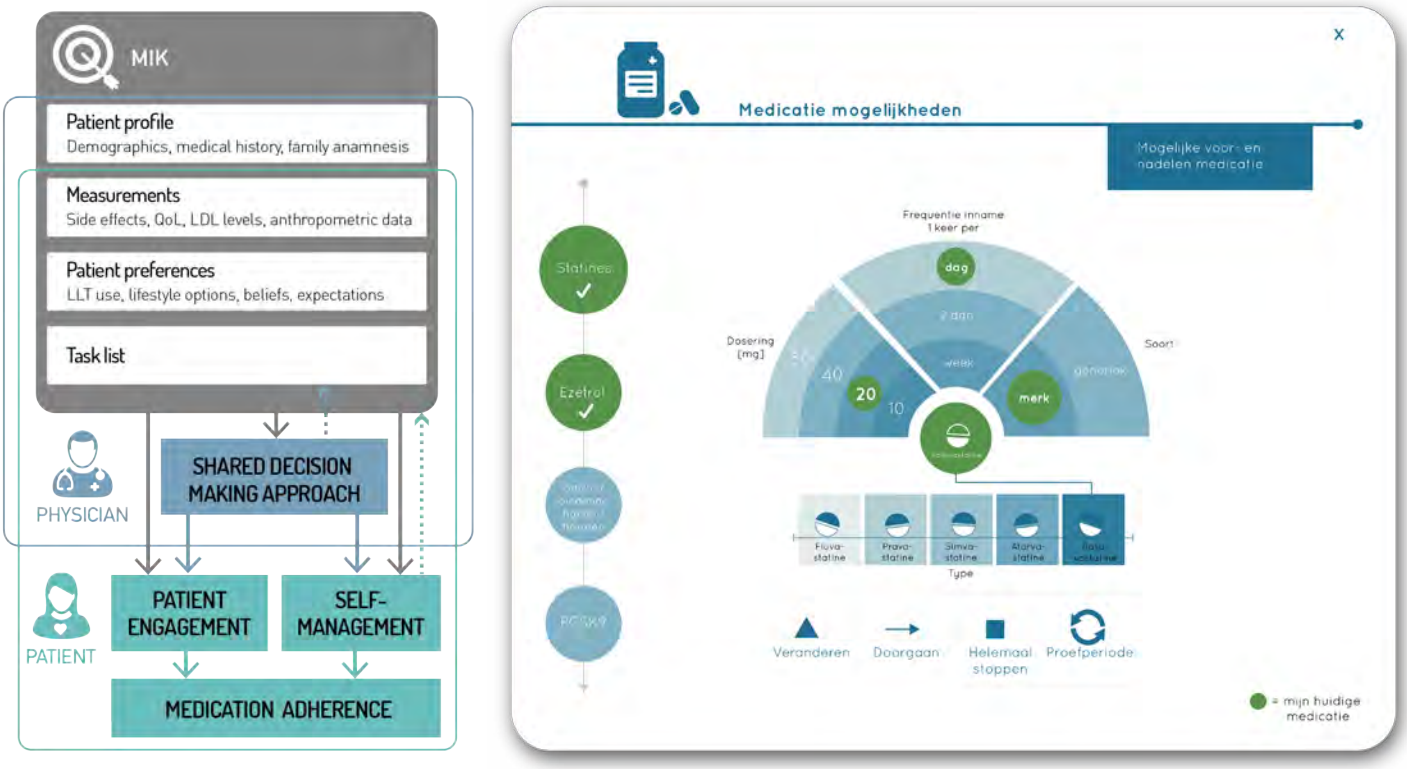


Figure 2. Left: Schematic overview of the functions of MIK. LLT: lipid lowering therapy; QoL: quality of life; LDL: low density lipoprotein (adapted from Thomson et al, 2018). Right: Example screen design MIK

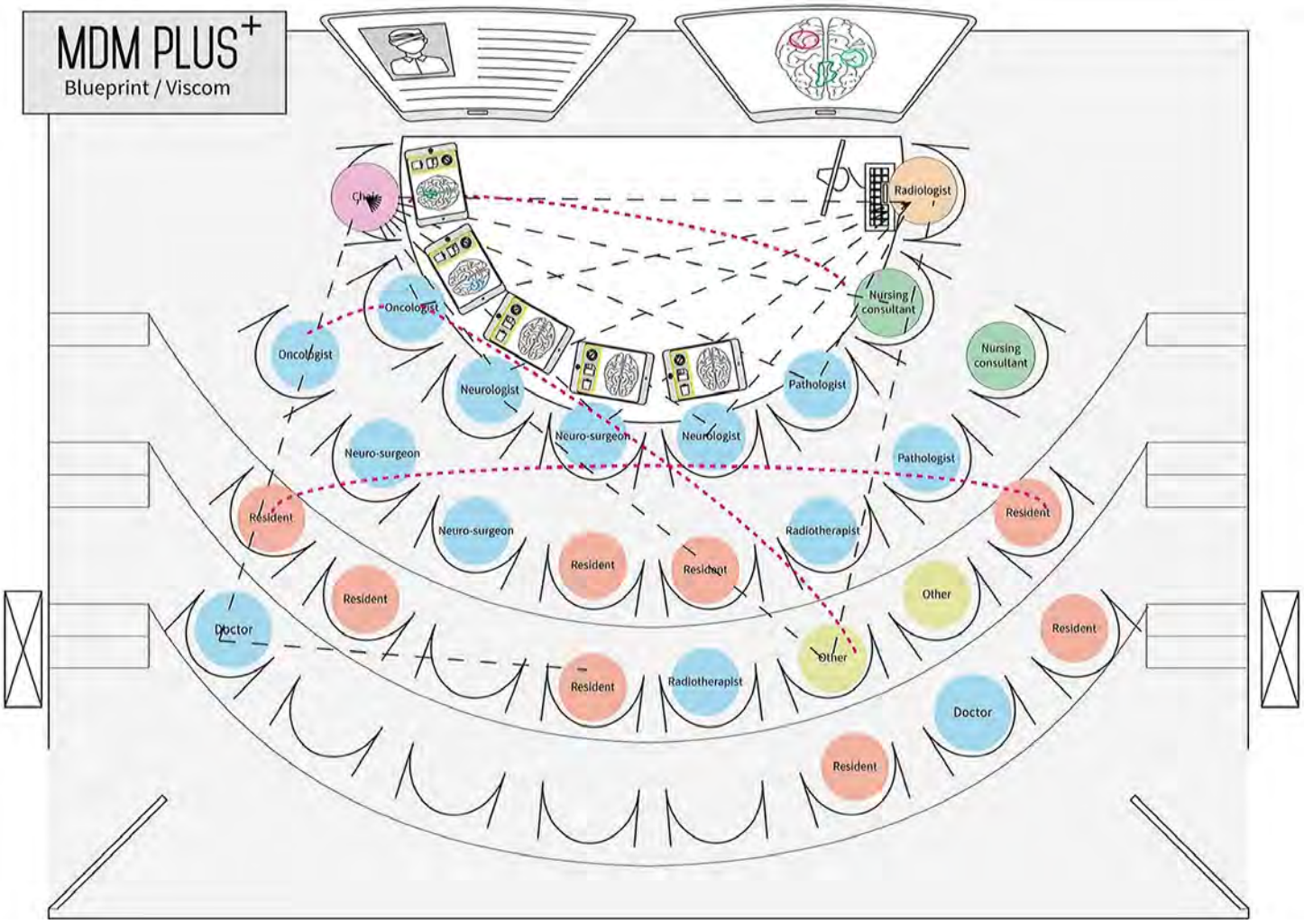
In HCD the term 'design' is used for both the process of designing and the outcome of that process. Moreover, design is no longer used as a process to create products only, but increasingly as a process that leads to the creation of any type of intervention that changes existing situations into preferred ones (Bijl-Brouwer & Dorst, 2017; Melles et al., 2021). This includes services, procedures, strategies, and policies. The design process itself is also more and more acknowledged as an outcome, in which a participatory design process contributes to broad support for change.

HCD designers rely heavily on the tools, methods and insights from the HF discipline. Examples of HCD methods range from shadowing and contextual inquiry to investigate human needs to participatory design and usability testing to develop and evaluate solutions. Tools often used for investigating teamwork dynamics, include patient journey mapping and contextual design techniques. Patient (or client) journey mapping is a tool to visually record the dynamics of a multi-stakeholder system over time, by including all actors, interactions between actors and experienced emotions (Melles et al., 2021). Starting from the patient journey, HCD designers can identify problems and how these problems arise, and thus identify human needs. Contextual design (Beyer & Holtzblatt, 1998) provides another structured approach to the interpretation of data from fieldwork with the purpose of using it for product or service development. One of the method's steps involves work modelling which is aimed at analyzing actual activities of users in their actual work environment from five different perspectives: ranging from the influence of the physical environment, the (actual) use of artifacts and the sequence of tasks to (in)formal communication patterns and cultural constraints. These different interpretations are expected to lead to a better understanding of the constraints posed by a (complex) work context and the needs of all the stakeholders (team members) who are part of a work system. Both tools aim to map out the larger sociotechnical system, to identify human needs in context, and to provide starting points for design.

HCD, with its systemic humane approach and creativity towards change, can play an essential role in dealing with complex teamwork challenges, as shown by the following examples.

Case 1. MIK: improving patient involvement and shared decision making

Medication non-adherence poses a serious and hard-to-tackle problem for many chronic diseases. Involving patients in care teams by increasing their engagement in their own care process and in decision making with their physician (i.e. Shared Decision Making (SDM)) seems essential to improve treatment adherence. In this project, we focused on people with Familial



MDM Environmental design guidelines (in order of importance):

1 Seating arrangement: enough places to seat a minimum of 30 people.
2 Spatial layout: possibility for at least two big screens on the wall, for presenting both relevant patient details and patient scans.
3 Everybody seated should be able to see the presented data on screen.
4 Every participant should be able to see everyone else.
5 Core members should be able to see each other without having to turn over 90 degrees.
6 Extended members should be able to see the core members' faces to allow for verbal and nonverbal communication.
7 Everybody who is seated should be able to hear each other without having to speak loudly.
8 Workstation placement: everybody should be able to hear and see the screen operator.
9 Movement: the door should be located in such a way that no one disturbs the meeting when entering or leaving the room. Therefore, the door should not be placed along the same wall as the screens.
10 Additional architectural requirements: good acoustics, dimmable light and control over ambient noise are highly desirable.

Figure 3. MDM Plus+. Top: lay-out of an MDM-room for neuro-oncology MDMs based on the environmental design guidelines for MDM-rooms (bottom). At the front row the five core members are seated, using the Viscom application.

Hypercholesterolaemia (FH), a metabolic disorder that causes the cholesterol levels in the blood to rise, which seriously increases the risk for developing cardiovascular diseases at a young age. Lifelong, daily medication in combination with a healthy lifestyle is essential to lower this risk. On top of this, finding the right medication for FH patients is often a trial-and-error process and FH patients typically do not (yet) experience actual health complaints. This lowers their sense of urgency to adhere to their medication and makes medication adherence among FH patients challenging.

We developed a digital app aimed to improve medication adherence of FH patients named "MIK" (Dutch for "to aim") (Thomson et al, 2018). MIK triggers

patients to have an active role in their own care process and makes implicit information regarding treatment preferences of patients explicit and in this way easier to discuss during consultations. Figure 2 lists the four main functions of MIK and how these are expected to impact patient engagement, SDM and medication adherence. The application lets the patient prepare for the consultation by filling in short questions regarding lifestyle factors, their values, and their treatment preferences. During the consultation MIK serves as a supportive communication tool by giving easy to understand graphics of the medication options and cholesterol results. Next to this, insights in patient preferences helps the physician to tailor individual treatment advice. This way MIK facilitates physicians and FH patients in a more equal way of communicating through shared information and decision-making.

MIK was developed through an iterative HCD approach involving FH patients and health care professionals throughout the design process to ensure that the design met the needs of both user groups. First the problem space was investigated by means of consultation observations, interviews and an analysis of posts on the FH patient Facebook page. This investigation resulted in a map of the current patient experience journey, which confirmed that physicians are in the lead throughout the care process, FH patients are more reactive, and decisions regarding medication are mainly based on medical data. Also, during consultations there is limited time and opportunity to discuss preferences, lifestyle and quality of life. After multiple follow-up co-design sessions, an interactive prototype of MIK was developed and evaluated in role-play simulations. Our studies confirmed that the functionality of MIK has the potential to improve patient engagement and SDM. Insights are used for further development of MIK and eHealth apps in general aimed at improving patient engagement and SDM (Thomson et al., 2018).

Case 2: MDM PLUS+: improving multidisciplinary team meetings

In hospitals Multi-Disciplinary Meetings (MDMs) are frequently used to discuss complex medical patients and to decide on the treatment strategy. The goal of this project was to create a set of feasible modifications to improve efficient MDM decision-making, and to introduce a product-service system for the medical staff to further develop their communication during the MDM and inter-collegial teamwork. The project took place at the neuro-oncology MDM at the Amsterdam UMC. The neuro-oncological MDM is challenged by the environment, which needs to be dark enough to assess radiography on a large screen, while at the same time a decision-making dialogue involving three to five professionals out of a large group of participants needs to take place. The discussion is fueled by the information on visible scans and the knowledge of the members. However, verbal and non-verbal communication are hampered by the theater lay-out, low light and large number of participants.

Fourteen neuro-oncology MDMs were observed and team members were interviewed. Work modelling techniques (Beyer & Holtzblatt, 1998) were used to analyze the interaction patterns between MDM attendants in relation to different factors such as the setup and influence of the space, lines of communication, and cultural rules and practices. This resulted in the identification of problem areas and opportunities for improvement (Beem, 2016).

MDM PLUS+ was developed to enable information exchange and discussion during multi-disciplinary team meetings (Beem, 2016). MDM PLUS+ consists of two parts:

1. The MDM Blueprint is a list of MDM room layout requirements, which are drafted as checklist. It can be used for two goals. First, to make feasible modifications to a current MDM environment and second, to design the most optimal interior suited for a neuro-oncology MDM (see figure 3).
2. The Viscom application aims to minimise differences in communication and proposes a way to visually explicate communication of core members by dynamic drawing on a live-synced tablet.

It was concluded that the core of the MDM is the discussion, which is fueled by the information on visible scans and the knowledge of the members, but the 'raison d'être' of the MDM is the information exchange. The final 'MDM PLUS+' concept proved to complement both the layout and the potential to let the top-specialists further develop themselves in inter-collegial teamwork and communication, thus resulting in a more efficient multidisciplinary meeting. The recommendations entail different future perspectives of the implication of the MDM PLUS+ to other MDMs and initial proposals to test the Blueprint and Viscom for future development, in general and for the Amsterdam UMC.

Conclusions and recommendations

As shown by the examples of MIK and MDM PLUS+, HCD offers a way to create actionable solutions for teamwork challenges related to the growing complexity of healthcare. By co-creation of new solutions HCD not only supports teamwork taking into account medical and human factors, but also facilitates teambuilding and engagement of all team members with the solution. Both are important prerequisites for implementation in daily practice. Thus, HCD offers an

action oriented approach to promote solutions that are medically sound as well and human-centered.

We recommend to foster design thinking in medicine, by education and experiential learning, to find innovative ways to support quality and safety of increasingly complex healthcare.
The examples presented took place in the Design Lab Quality of Care, a collaboration between the department of Human-Centered Design, TU Delft, and the section Quality, Safety and Organisation of Care of Amsterdam UMC (onderzoekpatientveiligheid.nl).

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