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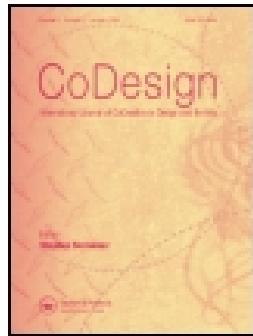
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# Learning histories as an ethnographic method for designing teamwork in healthcare

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## ABSTRACT

Designing for teamwork in healthcare requires a thorough understanding of the working context and routines of the different user groups involved. This paper presents a design project in the context of child oncology in which we demonstrate the use of a newly developed ethnographic method for design research called the learning history method. The results of this design research project demonstrate that the method provides the designer with a clear path to gather in-depth insights into the needs and wishes of different users and their interactions, while maintaining flexibility in execution. Moreover, the results also show that the proposed tangible outcomes of each design research step focuses high-quality feedback loops between the designer and the different users.

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Design ethnography; design research method; learning history; teamwork; healthcare

## 1. Introduction

Developing systems for complex environments such as healthcare requires an understanding of the viewpoints, working routines and needs of the different users (e.g. specialists, nurses, patients, informal caregivers). Ethnographic approaches for design, which arose in the 1970s, allow the designer to create such a broad view and understanding of the everyday lives of users (Baskerville and Myers 2015) and have also proven to be successful in informing systems design since they make the ‘real world’ sociality of a setting visible (Hughes et al. 1994). Foregrounding ethnographic design methods in an early stage of the design project is especially important in complex contexts such as healthcare, where involving users in the actual design trajectory is essential. However, without a proper understanding of their current (work) context and routines collaborative design activities between designer and user may lead to suboptimal solutions. The designer cannot design properly without ‘seeing first’, since the designer does not know what to appreciate and how to order things within the context (Schön 1984; in Buur, Binder, and Brandt 2000). Moreover, users cannot support the designer to see the right things, since they lack analytic sensibilities towards their own practices (Salvador, Bell, and Anderson 1999).

This paper aims to demonstrate the use and usefulness of *the learning history method* as a design research method for eliciting the needs of users with different (professional) backgrounds (Roth and Kleiner 2000). The method supports ‘seeing’ at the early stage of a complex design project, since the method focuses on creating an understanding of the details of the users’ current practices. The paper demonstrates that the learning history method could support designers in gaining an understanding of the complex context needed for developing a product or service that fits the wishes and demands of all users (Barab et al. 2004).

To show the value of the learning history method for designers, we present a design project within child oncology that focuses on how to improve teamwork by means of design, in particular parental involvement in medical teamwork. In the design project, we applied the learning history method to elicit a collective view of the users on how things currently are. In a later stage of the design process, this collective view can serve as a starting point for designing new interventions. We constructed a collective view without hampering the users during their primary tasks or without the need for all of them to assemble at the same time. Additionally, we used the method as a means to ensure regular involvement of the users in later stages of the design process.

The paper starts with a description of the learning history method together with an explanation of why it is applicable as a design research method. It continues with a section on design for teamwork in healthcare and a description of how we applied the learning history method in a design project in child oncology. The paper continues with the results and ends with a reflection on the design project and learning history method as a practical method for human-centred design for teamwork in healthcare. It also shows some first insights into the wider application of the learning history method.

## 2. Learning history method as an ethnographic method for design

The learning history method is an ethnographic method for design that provides guidance to the designer to create a holistic and descriptive understanding of the research context (everyday setting) by observing and actively engaging with different users during interim evaluation moments (Baskerville and Myers 2015). The method was originally developed as a method for collective learning in organisations (Roth and Kleiner 1998, 2000, xiv) and fits in the tradition of ethnographic studies aiming to improve and/or change organisations and organisational learning (see e.g. Senge 1990; Argyris and Schön 1978). It is based on a constructivist view on knowledge that states that knowledge is situated in artefacts, practices, and interactions (Roth and Kleiner 2000).

The core of the method is an ethnographic form of storytelling that results in *jointly told tales* (van Maanen 1988, 136–138). Jointly told tales are about events and/or matters in organisations that are seen from a combined viewpoint of different users. Jointly told tales incorporate the experiences of the different users with the (objective) viewpoint of the (design) researcher (Roth and Kleiner 2000, 190). To construct a jointly told tale, the (design) researcher observes the different relevant<sup>1</sup> users who make up the organisation (i.e. users of the same organisational system with different professional backgrounds, tasks, and goals) to distil noticeable results from them. Noticeable results are *outcomes* or *events* that ‘have been associated with an effort to instil learning

or improvement (Roth and Kleiner 1998, 51)'. The noticeable results are evaluated with the users. The (design) researcher checks whether the users agree with the interpretations made and discusses the significance of the event – which is a first step towards the development of themes.

This validation step is followed by a thematic analysis of the data, in which the (design) researcher combines viewpoints of the different users (Roth and Kleiner 2000, 190). The (design) researcher generates a title for each theme. Moreover, s/he writes a short description of each theme that tells the story behind that theme. This description includes the viewpoints of the users involved and the interpretation of the (design) researcher. The themes form together the structure for the jointly told tale. The (design) researcher discusses the jointly told tale with the users involved. During this discussion, s/he checks if their opinions have been 'fully captured, fairly treated, and considered in the light of the performance of the organisation as a whole (Roth and Kleiner 1998, 51)' and how the different individual users perceive the opinions of the other users. Gaps between the opinions of the individual users are the starting points for learning and/or improving the current situation.

We used the learning history method as the base for the further development of a design research method to support designers in gaining an understanding of a complex context. We based our work on the learning history method, as proposed by Roth and Kleiner (1998), and followed a design (research) process that consisted of six steps (see Table 1). The first three steps would traditionally be termed the *design research phase*. The last three steps are termed as the *conceptualisation phase*.

We apply the learning history method in such a way that it allows the designer to see the social context of work – in the presented design project we focused on teamwork – from multiple perspectives, without distracting the users too much from their daily routines.<sup>2</sup> It also supports short periods of fieldwork and a clear focus on specific work processes (e.g. teamwork). Designers can use the gathering of the noticeable results and

**Table 1.** Different design steps in the presented study, based on the learning history method (Roth and Kleiner 1998). Steps 1–3 concern the design research phase, steps 4–6 the conceptualisation phase.

Step	Aim	Research method(s)	Who involved	Outcome
1	Selecting the participants	Literature + informal talks	Designers + random users	Team map Participants
2	Mapping the perspectives of the individual participants	Shadowing + interviews + reflections of the users	Designers + (feedback) participants	Noticeable results Personal timelines
3	Merging the perspectives of the individual participants	Thematic analysis; synthesis of the results	Designers + feedback participants	Themes: the jointly told tale
4*	Creating a design vision	Choosing a theme (or combining several themes), formulating design directions	Designers + feedback (random) users	Design brief
5*	Design iterations	Prototype testing	Designers + feedback (random) users	Low fidelity prototypes
6*	Final evaluation	Prototype testing	Designers + feedback (random) users	High fidelity prototype

\* Steps 4–6 are outside the scope of this paper.

the construction of the jointly told tales as a quick way to work themselves into the complex problem they design for. Consequently, the learning history method fits under the umbrella of rapid ethnographic methods (see e.g. Millen 2000).

The learning history method connects ethnographic methods for design and human-centred design approaches in two ways. First, designers applying the method do not only focus on (status) relationships, personal expectations, and commitment, which are traditional aspects for ethnographic methods for design (Blomberg and Karasti 2013), but they also put a focus on ‘respect for different knowledge’ and ‘opportunities for mutual learning’. The last two aspects are termed by Blomberg and Karasti (2013) as typical research topics for human-centred design approaches. Second, co-reflections on the jointly told tales support the users to gain ‘analytic sensibilities’ for their own work (Blomberg and Karasti 2013) and, therefore, support designers with the elicitation of the wishes and demands of the different users which the designer needs during the conceptualisation phase (Barab et al. 2004). Both aspects relate to a smooth and gradual transition between the ethnographic work and the actual design work.

Moreover, the way we developed the method guides designers to present the results of the ethnographic study in such a way that they are quickly accessible and relevant for designers (Hughes et al. 1997; Karasti 2001). Table 1 shows that each step delivers a tangible outcome that can be used to discuss preliminary findings with the users. These tangibles support the creation of a shared understanding among the designer(s) and the users about the content and progress of the design project.

Other designers have also successfully used the learning history method to study the topic of shared understanding in design teams (Kleinsmann and Valkenburg 2008), collaboration in inter-professional medical teams (Caprari et al. 2018) and for the purpose of inter-organisational learning in the field of architecture (Kleinsmann, Beekman, and Stappers 2010).

In this paper, we demonstrate the use of the method in a design project where we aimed to improve teamwork in the context of child oncology. Since the method covers mainly the design research phase, these steps are explained in detail in this paper. The approach and results of the conceptualisation phase are outside the scope of the paper. For the approach and outcome of this phase, see Sarri (2014) and Sarri, Kleinsmann, and Melles (2015). The next section briefly describes the topic of teamwork in healthcare to position the design research project and show its complexity.

### 3. Design for teamwork in healthcare

Over the past two decades, increasing attention has been paid to teamwork dynamics in the healthcare domain, i.e. high-quality interactions between medical professionals and between patients and medical professionals (e.g. Baker, Day, and Salas 2006; Burtscher and Manser 2012; Ezziane et al. 2012). In the first place, this is because research has shown that communication and collaboration failures in our complex care delivery system contribute enormously to the causes of adverse events (resulting in preventable patient harm) and inefficient work processes (Fortune et al. 2013; O’Leary et al. 2012). Second, however, this increasing attention for teamwork is because a well-coordinated team also produces many benefits. For instance, high-quality (inter-professional) teamwork leads to better working conditions and lower

staff turnover and thus contributes to a more sustainable healthcare system (O’Leary et al. 2012). Moreover, patients who experience good teamwork with their medical team report that they are more satisfied with the care they receive and show better health outcomes regarding, for example, self-management and treatment adherence (O’Leary et al. 2012). Therefore, enabling and supporting teamwork is a way to foster safety, efficiency, and the quality of care. At the same time, enabling good teamwork in healthcare is hard as the working routines and goals of the different staff members vary, from specialists who work according to well-established protocols and treatment processes to nurses who might work on a more ad hoc basis due to the regular occurrence of unexpected events (Norman and Stappers 2015). Furthermore, the context is characterised by multidisciplinarity and changes in team compositions due to, for example, shifts. Multiple decision-makers are present and various professions work in clearly delineated sectors, each with specific skills and expertise. In addition to this, the healthcare setting is a constantly changing environment that is unpredictable and under time pressure. All this makes the healthcare setting challenging to work in at both an individual and a team level and implies a need to align the actions taken towards the ultimate patient care goal (Caprari, et al., forthcoming).

Design research is increasingly recognised as being a valuable contributor in addressing the complex challenges faced in healthcare in general (e.g. Erwin and Krishnan 2016; Wildevuur et al. 2017), and regarding teamwork in healthcare in particular (e.g. Caprari et al. 2018; Griffioen et al. 2017; Melles et al. 2014; Thomson et al. 2018). As healthcare is a complex sociotechnical system involving many users and stakeholders with different professional backgrounds, teams and sub-teams, technology, and wider processes, sustainable solutions for high-quality teamwork and consequential organisational change cannot be achieved in isolated (sub)systems (Holden et al. 2013). Designers are increasingly frequently being asked to (re)design (for) complex socio-technical systems in healthcare, since they are skilled at problem-finding, dealing with incomplete information, and prototyping possible solutions (Cross 2006; Norman and Stappers 2015). They are trained to take a human-centred perspective (Erwin and Krishnan 2016; Høiseth and Keitsch 2015; Tsekleves and Cooper 2017), although still capturing a holistic understanding of the care situation, considering its contextual, functional, and economic aspects. Moreover, designers are trained to actively use different viewpoints (e.g. Beyer and Holtzblatt 1998) to develop alternative solutions, which they often make tangible with drawings and prototypes (Boess, Pasman, and Mulder 2010; Kleinsmann, Valkenburg, and Buijs 2007; Sanders and Stappers 2008), in this way creating an understanding of the different viewpoints and interests among the different users (Arias et al. 2000). Furthermore, participatory design methods have gained popularity and acceptance in healthcare, empowering caregivers and patients to take ownership in shaping their work and care (e.g. Donetto et al. 2015; Reay et al. 2017).

Yet, designers are only successful in healthcare transformation if they understand the specific context. This is challenging. We think that the learning history method as we developed it could support the relatively fast creation of an understanding of teamwork, work and care processes and the context in which the inter-professional team operates.

## 4. Design project and design research approach

### 4.1. Research context: teamwork and parental involvement in child oncology

Today's society is heading towards a healthcare system that not only depends on healthcare professionals, but also relies on the participation of people without any formal medical degree (e.g. Coulter 2012). This is driven by cost reduction, but also by today's patients and informal caregivers who demand to have an active role in their care process. Consequently, we are moving from a system in which medical specialists take all the decisions to a system of collaboration and shared decision-making between medical staff, the patient and his or her relatives (Stigglebout, Pieterse, and de Haes 2015). This is also the case in child oncology. Within child oncology, hospital management aims to create a high-quality work environment in which medical staff can work together to their full potential in collaboration with the parents of the child. In practice, however, it is not always obvious how to embed or facilitate such collaboration. The challenge of the design project presented here was to investigate how design can improve such parental involvement in the medical team.

Since child oncology, like most healthcare settings, is a hectic and emotionally charged domain, it is of great importance to use design methods that suit the requirements posed by such a specific context. This means that design research methods should not be time-consuming or in any other way stressful or distracting for the users involved. Additionally, these methods should support the designer in combining and integrating the viewpoints of different users. Examples of methods that meet these criteria include patient journey mapping (Trebble et al. 2010) and work modelling, an analysis technique of work based on different views that range from a workflow perspective to a cultural perspective (Beyer and Holtzblatt 1998; Melles et al. 2014). Both patient journey mapping and work modelling are methods based on data collected through observation and, if possible, interviewing. As said, in this current study, we explored the use and added value of the learning history method (Roth and Kleiner 1998).

The specific design challenge presented in this paper was to design a product or service to enhance parental involvement in the child oncology medical team. At the start of the design project, it had not as yet been identified what the role of the parents was and what knowledge and/or tasks they could contribute to this team. To develop a solution that would fit the whole sociotechnical system of child oncology care, we, therefore, needed to understand the current practices and dynamics of the teamwork in the whole medical team, including parents and patients. Providing care for children suffering from cancer requires the flexibility to react to widely divergent and unforeseen situations. Often these situations are solved on an ad hoc basis, and it is not always possible to keep a record of the solutions. This hampers teamwork and the transparency of the care process.

### 4.2. Design research approach – learning history method

Our first aim was to map the sociotechnical system of child oncology care with a focus on teamwork dynamics. Below we first describe how we did this with the use of the learning history method (three steps). Next, we describe the results of each step.

#### **4.3. Step 1: selecting the participants – team map and design focus**

To sample the participants of our research, we started the design research phase with a literature review, that provided us with an initial understanding of the design context. In addition to the literature review, we did informal interviews with our various stakeholders that could become future users of the design, including parents and patients, about their involvement and roles in the care process. Based on the literature review and the interviews, we plotted a team map (that is different from the team hierarchy described in literature that is based on tasks and responsibilities). In this team map, the patient (child) is the central person, and the distance between the patient and other users represents the intensity of their interaction according to the patient and parents (higher distance means lower intensity). The map formed the core starting point for the design research phase and highly influenced the sampling of participants.<sup>3</sup> We also used the map, for example, to explain to the different medical users how the child and the parents perceived the child oncology team. This triggered the first reflections on teamwork which, in turn, provided the designer with focus for step 2. He learned, for example, that the team organised their communication often in an ad hoc manner, but that there were also formal communication moments everyday. He also learned that the team had miscommunications as a result of their different knowledge and tasks and decided to focus on this aspect. Through the literature review on teamwork, the designer got introduced to Carlile's framework (2004) that explains problems with knowledge exchange in connection to the level of novelty of the information that needs to be shared between users with different backgrounds and tasks (Carlile 2004). Carlile developed a framework that explains three progressively complex knowledge-sharing processes – (1) transfer (relates to information processing and questions if knowledge is shared or not), (2) translate (relates to interpretive differences and questions if knowledge is interpreted similarly by all individuals), and (3) transform (relates to knowledge generation practices and questions if there is a shared view on the consequences of the knowledge generated for each individual). The framework supports the specification of a mismatch in communication and as such it provided the designer with the knowledge to recognise events related to teamwork and communication that required improvement on different levels of complexity.

#### **4.4. Step 2: mapping the perspectives of the individual participants – noticeable results and personal timelines**

The aim of the second step was to determine the ‘noticeable results’ for each individual participant. One of the authors (designer) shadowed the selected medical participants during one complete shift. He documented the observations – focused on knowledge exchange between diverse users – on paper and important contextual/environmental aspects of the medical participant’s daily work (e.g. meeting rooms, medication storage, shared spaces) were photographed. Spending a full day with one participant enabled the designer to empathise with them and to understand their tasks, responsibilities and goals, as well as feelings and motivations in relation to teamwork and knowledge exchange for that day. This is a necessary step to increase the knowledge about the users’ worlds through immersion in their experience without judgement. From the

notes and photos, the designer distilled noticeable results. The designer labelled events as noticeable results for a variety of reasons including: many users involved (elaborate knowledge transfer needed), emotional peaks or lows,<sup>4</sup> important medical team decisions from a care process point of view (e.g. have surgery or not), technology playing a role as enabler/disabler of knowledge exchange, or recurrent communication moments in daily care that are recognised by multiple users (both participants of the study and others in the team).

After initial selection, the designer assessed his view of ‘noticeable’ with each involved participant in an interview. The interviews were audio-recorded and documented on paper. This was an opportunity to further explore different point of views, concerns and personal goals. But also to allow participants to suggest additional moments which they think that matter.

We put the noticeable results in a chronological order, resulting in a personal timeline for each participant. In the timelines, each noticeable result was described through an engaging quote and an explanation related to teamwork. These personal timelines supported us in understanding the users’ team-working practices and in determining other users involved in problematic or stressful situations. Additionally, the designer discussed and checked the timelines with the users during an interview. The interviews were recorded and the designer made notes about highlights of the interview.

#### **4.5. Step 3: merging the perspectives of the individual participants**

The designer then combined the timelines and noticeable results from the different participants to create themes through thematic analysis. These themes together formed the jointly told tale of teamwork in child oncology. Each theme describes a crucial situation or work routine in everyday teamwork where design could contribute in improving the situation.

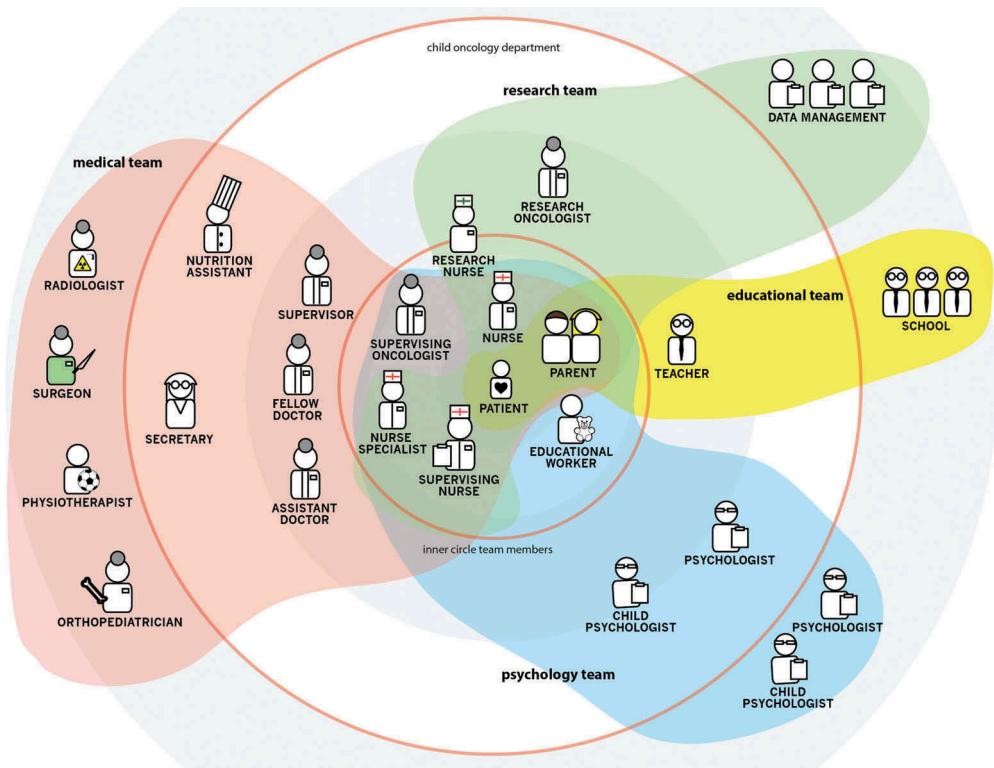
We selected these themes because (1) they were noticeable for more than one individual, meaning that they impact teamwork and knowledge exchange (mostly because of multiple conflicting concerns and/or emotional responses), (2) they were mentioned multiple times by different participants during the interviews (recurring knowledge transfer with lower level of novelty), (3) they were about a new situation for the participants (knowledge transfer with a high level of novelty), and (4) they seemed suitable for improvement by means of a design intervention. The designer visualised all themes to be able to validate the interpretations made with the participants.

The designer checked with all participants if they recognised the stories of each theme they were involved in. This was the first time that the participants were informed about the viewpoints of the other participants, which provided interesting insights in conflicting concerns. The designer used these conflicting concerns to define challenges that formed the starting point for the design process.

## **5. Results**

### **5.1. Results step 1: sampling the participants – team map**

The first result is a team map showing all the different user groups involved in the child oncology care process (see [Figure 1](#)). The designer identified 25 different user groups



**Figure 1.** Child oncology team map plotting all different users involved in the child oncology care process.

and the informal interviews with the users provided us with the insight that the child oncology team could be divided into four different sub-teams, according to expertise and responsibilities concerning the care process: (1) the medical team, (2) the research team, (3) the psychology team, and (4) the educational team. These four sub-teams are shown on the map. We evaluated a draft version of the map with several medical participants. They recognised their work system and gave input for further detailing.

Based on the map, we decided to include all user groups in the inner circle who have frequent face-to-face interaction with the patient and parents in our research. Throughout the design project, we involved 12 participants who represented the eight different user groups of the inner circle (see Table 2). Medical staff members were shadowed for one shift, parents and patient were interviewed.

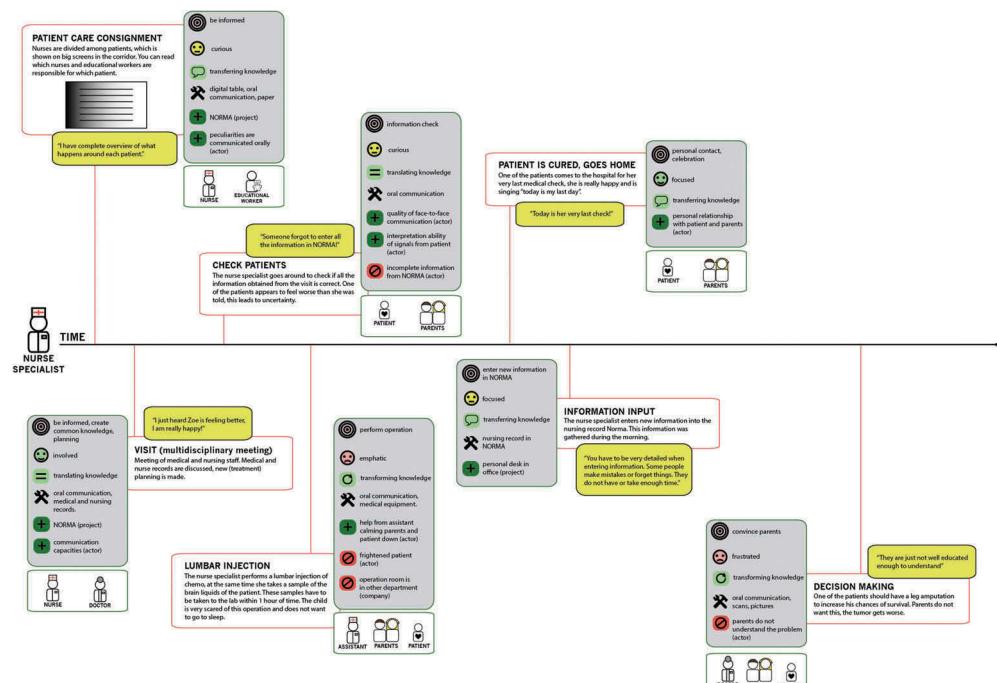
## 5.2. Results step 2: mapping the perspectives of the individual participants – noticeable results and personal timelines

Based on the observations and interviews, the designer defined individual noticeable results for each participant. In total, we defined 34 noticeable results for all 12 participants. Examples of noticeable results are ‘communicating with parents when they disagree with the prescribed treatment’ (noticeable result for the oncologist), ‘exchanging knowledge in

**Table 2.** Selected participants for the field research,<sup>5</sup> representing the eight user groups in the inner circle of the team map (see Figure 1).

Participant	Gender	Number of participants
Supervising oncologist	Female	1
Supervising nurse	Female	1
Nurse	Female	1
Research nurse	Female	1
Nurse specialist	Female	1
Educational worker	Female	1
Parent	3 Female, 2 Male	5
Patient	Female	1
<i>Total</i>		12

multidisciplinary team meetings' (noticeable result for the nurse), and 'lack of knowledge in how to prepare your child for surgery' (noticeable result for a parent). The designer created for each participant a timeline with all the noticeable results placed in chronological order. He used these personal timelines to discuss the findings with the individual participants to check the interpretations made. Figure 2 shows one of the timelines we created, i.e. the timeline of the participating nurse specialist. This particular timeline contains six noticeable results. Each noticeable result is presented with the use of an infographic that include a title, a brief description, and an illustrative quote of the 'owner' of the noticeable result. The involved users are indicated by icons. In addition, for each noticeable result, the following 'dimensions' are defined: (1) the goal or aim of the participant related to the noticeable result (e.g. be informed), (2) the emotional state of



**Figure 2.** Example of a personal timeline with noticeable results (personal timeline of the participating nurse specialist).

the participant regarding or during the noticeable result (e.g. curious, or involved), (3) the knowledge transfer boundary between the participant and the involved users (i.e. transfer, translate or transform as defined by Carlile's framework for managing knowledge across boundaries (Carlile 2004)), (4) tools and/or (contextual) artefacts that facilitate the noticeable result (e.g. nursing records), and (5) barriers and enablers of the noticeable result (e.g. face-to-face communication, objects in the physical environment).

### ***5.3. Results step 3: merging the perspectives of the individual participants – jointly told tale***

Based on the individual noticeable results, the designer identified seven overarching themes regarding teamwork – with an emphasis on knowledge exchange – and parental involvement in particular. The themes together make up the jointly told tale of teamwork in a child oncology ward from the perspectives of both the different users and the designer. In other words, the themes are a collection of different viewpoints on the same event, describing encounters between different users in which knowledge needs to be communicated and aligned. We identified seven themes. To illustrate how and why we chose certain themes, all themes are described briefly below:

#### ***5.3.1. Information exchange in multidisciplinary teams***

The medical staff meets daily to discuss the progress, diagnosis, and treatment of all patients. The participants all explained that this information exchange is crucial for the treatment and care process of the patient. This sometimes causes stress since they have difficulties with knowledge-sharing to create one shared view about the illness and treatment of the patient and to make joint decisions regarding treatment and planning. The designer interpreted that the main challenge here is that communication is at times unclear, which leads to performance anxiety among the users involved (which is reinforced by hierarchical differences).

#### ***5.3.2. Information exchange in single-disciplinary teams***

All sub-teams meet daily (or at shift change, in case of the nurses) to exchange information about all patients who are treated at the ward. These meetings involve users of the same discipline. They share the same professional background, but may differ in level of experience. The participants explained that the information exchange is often incomplete and that they had difficulties in creating a shared understanding of the situation, since experience levels vary and the amount of time available to discuss patients is limited. The designer interpreted that the main challenge here is the incompleteness of the information and the lack of a possibility to ask additional questions from the person who did the previous shift.

#### ***5.3.3. Communicating research participation to parents***

Clinical research is vital for the development of new medicines and novel treatments in the fight against cancer. For this type of general research, the early participation of cancer patients is essential: when a new patient is diagnosed with cancer, they preferably need to be involved in research as soon as possible. The medical researchers explained that they find it a challenge to explain the different kinds of research to the

parents in a way that is understandable for them, since they often have no medical background. The parents told that the information was already difficult in itself, but also that the stressful emotional situation in which they have to digest great amounts of information makes it even more challenging. According to the designer, power distance and differences in medical education hampered teamwork between the medical researcher and the parents. The designer considers this to be the main challenge in this theme.

#### **5.3.4. Integrating research tasks in the daily care process**

Parents told us that they are often not willing to let their child participate in research as they do not want their child to get even more distressed by extra treatments. The research nurses anticipate this: to make sure that the young patients are not distressed by the on-going research, the gathering of extra (blood) samples and measurements has been integrated into patients' daily care process as much as possible. Nursing and medical staff gather these extra samples for delivery to the research nurse. The research nurse explained that the samples are not a top priority for the nursing and medical staff, which leads to incomplete samples and thus hampers the research. The nursing and medical staff in turn find it hard to obtain all the information from the research nurse. So, the designer interpreted that the main design challenge is to improve the collaboration between the different user groups at the task level and to optimise the integration of research tasks in daily care.

#### **5.3.5. Preparing patients and parents for surgery**

Surgery is an impactful event for patients and their parents. The educational worker has to explain to the children and parents what they can expect, which they find a difficult task. The parents clarified that this is because the language that the educational worker uses is sometimes hard to follow. The designer concluded that the main challenge is to inform patients and parents using language that is understandable for them; the current knowledge of the educational worker has to be connected to the knowledge level of the child and parents.

#### **5.3.6. Recognising the child's behaviour and needs**

The parents explained that they feel helpless and want to participate in the care of their child. They say that they are, for example, good at recognising and translating their child's behaviour and needs to the other user groups. Currently, however, their input in the care process is not always acknowledged by the medical staff or experienced as constructive. The design challenge that the researcher detected here is to determine a role for the parents that contributes to the collective aim of care for paediatric oncology patients is acknowledged by all team members and fits the specific skills of parents.

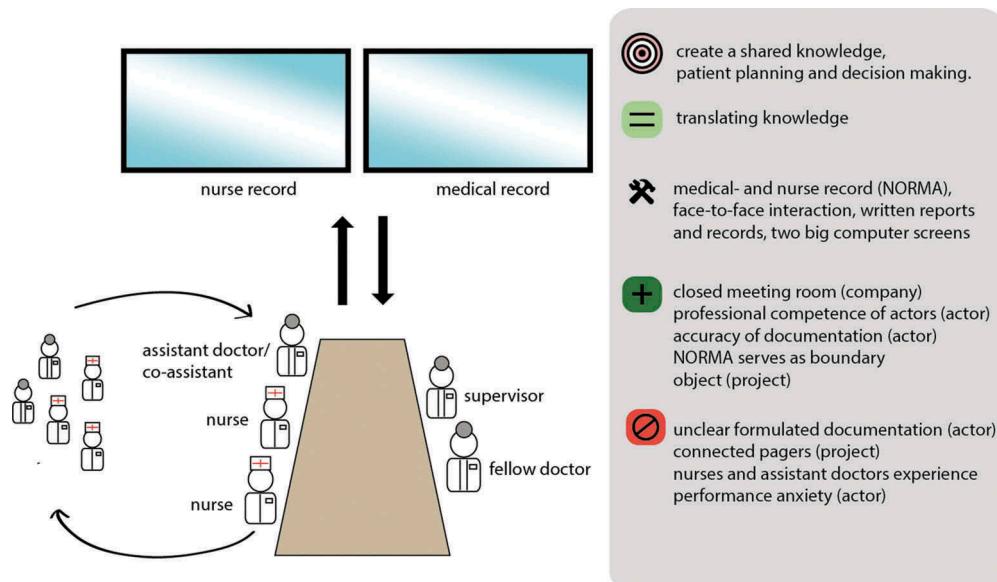
#### **5.3.7. Managing medication together**

The parents and nurses explained that medication intake is often emotionally stressful for the child. Parents and nurses also told that they have developed their own tricks and distraction techniques to improve the child's attitude towards medication regimens. However, these tricks are not shared between user groups. This is unfortunate, as adherence to medication therapy is a serious problem in child oncology that requires

teamwork, since the different user groups (e.g. medical doctor, nurse, parent) execute part of the treatment. The designer concluded that the knowledge-sharing problem about the tricks, in combination with the obvious shared goal (medication intake/adherence) and the potential contribution of parents to this shared goal seems a promising opportunity for improving parental involvement in the medical team. The design challenge is to seize and support this opportunity and to improve knowledge exchange.

The designer visualised all themes. These visualisations make the jointly told tale tangible and usable for discussion with users. Figure 3 illustrates how one of the themes was visualised (see (Sarri 2014), for the complete overview). Each visualisation consists of a schematic representation of the situation in context as perceived by the users involved and the main artefacts in the context that impact the interaction between the users. Figure 3, for example, shows the visualisation of the theme on information exchange during multidisciplinary team meetings. The visualisation shows the layout of the room (i.e. one big table and two screens displaying the medical and nursing record), the different users who attend the meeting, their specific location in the room and the main information flows between users and artefacts indicated by arrows. For each theme, the five main characteristics are listed on the right: goal of the event (e.g. decision-making), the knowledge transfer boundary between the involved users (i.e. transfer, translate or transform (based on Carlile 2004)), tools that are used (e.g. written reports, electronic medical records), and enablers of communication and barriers. For each theme, all five characteristics are described and listed to the right of the visualisation, facilitating comparison and discussion of the themes.

Interesting insights arose when comparing the shared goals with personal goals and responsibilities from the different participants (captured in the timelines), since



**Figure 3.** Example of how a theme is visualised (in this case information exchange in a multidisciplinary team meeting). All themes together make the jointly told tale.

the designer found conflicting concerns of the different participants involved. The visualisations served as a tangible method to discuss the findings and insights with the participants. Based on these discussions, the themes were compared, further detailed, and completed. Finally, we decided on how to continue in the subsequent conceptualisation phase. These conflicts were the starting point for the design process. In the design project, we combined the themes of recognising the child's behaviour and needs and managing medication, which formed the starting point for our further design work. With this choice in design direction, we completed the design research phase and started the conceptualisation phase. More information about the conceptualisation phase can be found in Sarri, (2014) and Sarri, Kleinsmann, and Melles (2015).

## 6. Conclusions and reflections

This paper demonstrates the use of the learning history method as an ethnographic method for design that is applicable during the design research phase of a design project. The method consists of the basic building blocks of the learning history method as proposed by Roth and Kleiner (1998), enriched with design-specific steps and with visual ways to represent the insights gathered. Moreover, the study supported the use of learning histories proved to be a successful method for design research in the context of healthcare (requiring flexibility and unobtrusiveness). First, this is because the method provides the designer with a clear path to follow, while maintaining great flexibility in execution. Second, the learning history method supported the designer in the creation of fast feedback loops with the participants; it presented the designer with an opportunity to empathise with the different users during the entire design research process. Below, we will reflect in more detail on each of the steps taken. We will conclude with some general reflections on the potential of applying the learning history method in design research for healthcare.

### 6.1. Reflection step 1

Design literature explains that the first step towards successful user research in sociotechnical systems is to select good representatives for each user group (see e.g. Morelli 2006). To obtain an initial understanding of the system, the designer did a literature review on teamwork in (healthcare) organisations. From this he learned that he should approach the system as a network of interconnected user groups. The designer based the division into user groups on shared responsibilities, tasks, and working practices. This view allowed him to think about the system from users' perspective as Baines et al. (2007) proposed. It enabled him to work around the hierarchies that are still strongly present in the healthcare environment, which is necessary to investigate teamwork. The designer created a team map as presented in Figure 1 to explain his findings to the users. The evaluation of the team map also initiated a collaboration between the designer and the users that would last throughout the design process.

## 6.2. Reflection step 2

The designer used the learning history method for mapping the daily experiences and the noticeable results of the different users in their natural habitats. The personal timelines provided detailed representations of users' individual perspectives on common experiences and shared situations. They provided the designer with a thorough understanding about the dynamics of the everyday working practices of *each* user group. The timelines show the social processes of the individual users, including barriers, enablers and emotions, as well as the tools and equipment they used to do their tasks which, thus, influenced their everyday working practices. The approach provided an understanding of the current situation without creating stressful or disturbing situations. So, the initial shadowing of different users, paired with the follow-up interviews used to determine the validity of the researcher's interpretations, allowed the researcher to quickly elicit knowledge from the users and to find design challenges to continue with.

The personal timelines also supported the designer in gaining an initial understanding of the time-related social connections and relationships between the users present in the system and how they changed overtime. The shadowing of the users deepened the bond between the designer and the users. The designer created empathy with the various users and the users became interested in the design project. Additionally, they became also engaged, interested, and active in coming up with solutions and new insights in later stages of the design process. This was surely amplified by the tangible outcomes of the separate research steps. The content of the data was captured through easy-to-read infographics that all the users found insightful. Since the infographics provided the users with an initial understanding about each other's working processes and the barriers and enablers that they perceive, they even improved the social process in the design project before an intervention was developed! This shows that we developed the learning history method into a user and designer friendly format (Hughes et al. 1997; Karasti 2001) that in its execution already improved teamwork in child oncology.

## 6.3. Reflection step 3

Subsequently, comparing and analysing these timelines of the individual users resulted in overarching themes. These can be seen as solution spaces that consequently emerge when the points of view from the different users regarding a specific situation are merged and compared. The study shows that the themes supported the designer in predicting and imagining future interactions and in translating the insights into a concrete design vision, allowing the designer to give a clear description of multiple, previously ill-defined, problems. This means that the jointly told tales could represent the perceptions of the users in such a way that they become useful design input (Salvador, Bell, and Anderson 1999), which ease the transition to the design phase.

Outside the direct scope of the paper, but interesting to mention here is that the designer maintained high user engagement throughout the conceptualisation phase of the design process. He used physical interaction prototypes to test and assess how users will experience future interactions with the system. These prototypes enabled the generation of scenarios for future system-user interactions, which were important for the further exploration of the problem area, the detection of bottlenecks and

the refinement of the design brief and requirements. To involve all the different users throughout the conceptualisation phase of the project, different interaction prototypes were created. The close relationship gained with users during the design research phase due to their high involvement eased the presentation of early prototypes of our ideas. Since the different users already had a general understanding of the project, they took these iteration loops seriously even though the prototypes were ‘unfinished’. This allowed us to quickly gain new knowledge about important problems around medication intake and actively involve users in the creation of the final design. During the evaluations of the prototypes, the users pointed out the erroneous assumptions that the designer had relied on in creating his first prototypes. The different iteration loops and final design are described in Sarri (2014) and Sarri, Kleinsmann, and Melles (2015).

The advantages of the learning history method were also confirmed by another designer – whose work was inspired by (Sarri 2014) – whose aim was to improve teamwork in an orthopaedic clinic by means of design (Caprari et al. *pre-press*). Caprari et al. applied the learning history method in her design research phase and followed the steps as prescribed in this paper. Her work affirms the potential of the learning history method in helping to collect many design-relevant insights into the specific theme to be analysed, i.e. teamwork. Caprari et al. also stresses that the important additional advantage of the learning history method was that it created a bond between users and designer throughout the entire design process. Caprari et al.’s study is a first step towards a broader application of the learning history method.

We aim to continue applying the learning history method in different design projects and further investigate its added value within and beyond the healthcare domain. This will enable us to further optimise the application of this new design research method and demonstrate its added value for a variety of design problems and application areas.

## Notes

1. Focusing on key informants is in-line with earlier work on design ethnography (see e.g. Millen 2000). Focusing on key information, instead of taking a ‘wide-angle’ view, saves time during both the fieldwork and the data analysis. The design brief provides focused questions that determine the lens.
2. Shadowing a care professional may seem to be a high level of access that will hamper the care professional in the performance of his/her task. However, care professionals are often shadowed by medical interns. Therefore, our way of working is closely related to and fits their daily practice. Consequently, medical professionals will not feel disturbed/bothered by the designer (which the medical professionals of this study confirmed).
3. *All selected participants voluntarily participated in the study. We complied with the hospital research and employee code of conduct, verbally informed the participants about the study and anonymised all data used for analysis and communication purposes.*
4. The emotional state is based on what participants say, how they behave and their facial expressions. This initial interpretation of ‘how they felt’ is then validated with the same participants.
5. All participants were connected to the child oncology department of one specific Dutch hospital. The medical staff participated in interviews and observations; parents and patient were interviewed only.

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No potential conflict of interest was reported by the authors.

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