

THROUGH THE EYES OF NURSES: USER-FOCUSED DESIGN APPROACH IN NON-CLINICAL AREAS OF PUBLIC HOSPITALS

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Abstract

Objective – This paper investigates nurses' perspective toward the concept of user-focused design approach implemented in hospital waiting areas. The study is based on perspective of nurses from ultrasound ward in a public hospital called 'Rigshospitalet', Denmark.

Background – Rigshospitalet has made a specific design guideline called 'the Design Manual' based on data collected by anthropologist researchers and hospital architects. The guideline has been applied in the redesign of non-clinical areas as part of renovation throughout the hospital.

Research question – How involvement of clinical nurses influences the design of waiting areas in a Danish public hospital and how the specific design guideline 'the Design Manual' can be implemented in the design process across disciplines.

Methods – This study was conducted by combination of methods starting with document analysis followed by empirical data collection divided into three steps. First, a brief evaluation of a waiting area in the ultrasound ward. Second, two meetings between researcher, clinical nurses from the ward, and a hospital architect. Third, interview with six nurses. Data from the meetings were analysed using interdisciplinary design approach and interviews were transcribed and analysed by use of open-coding.

Results – The brief evaluation of the ultrasound waiting area gave overview of the architectural quality. Meetings with nurses gave architects specific requirements and the design manual was used as communication tool across disciplines. The manual can help to accelerate the design process. Interviews with the nurses provided insights regarding patients' needs and specific requirements for furniture, zoning, and highlight that nurses understand the user-focused approach and underpinned important aspects for the design.

Conclusion – A design manual is a suitable tool that hospital architects and related professions can use to communicate with staff, patients, and caregivers during design briefing. The design manual can specify user profiles and their needs. However, the interviews with the nurses address that a design manual to bring benefits should be updated frequently to meet the needs of different group of users.

Keywords: *Nurse involvement | design manual | waiting areas | public hospital | Denmark*

1. Introduction

Visiting a hospital can be time consuming, as waiting is an integral part of the healthcare experiences [1]. Non-clinical areas such as restaurant, café, library, and waiting rooms are provided to support patients and their family during the waiting time. Waiting periods at the hospital are perceived as long, uneventful, and stressful [1][2]. Therefore, many hospitals intend to improve the quality of the physical setting of non-clinical areas, as this can improve the experiences of patient and family by reducing anxiety, boredom and similar negative emotions during the waiting time [3].

The rise of the Evidence-based design approach in the past decade amply supports the implementation of a patient-focused approach in the design of hospitals [4]. Planning and design of healthcare facilities have shifted focus to patients' needs, perception and satisfaction [4][5][6]. The user-focused approach has been applied in many hospitals in western countries to improve the physical setting of both clinical and non-clinical areas [7][8]. Patients' needs are key evidence in creating healthcare environments that improve the clinical outcomes. There is also an increasing involvement of clinical nurses during hospital design processes [9]. Clinical nurses' involvement during the design process can add value to the design discussions and create areas that are aligned with patient needs [9]. Clinical nurses are likely to be the most knowledgeable and experienced of all healthcare providers about the needs of patient since they are in attendance and provide care for patients 24 hours 7 days per week [6][9].

Denmark is one of the European countries that promotes the concept of patient empowerment as the Danish government support the concept of patient-centred design and patient empowerment through involvement. Danish

hospitals aim to improve the quality of care in the hospitals. This includes different aspects, for example clinical services, patient safety, involvement and communication, information, discharge, inter-sectoral cooperation, free hospital choice and reduced waiting times [10].

Rigshospitalet is the main national university and teaching hospital in Denmark with 1,500 beds. It is located in Copenhagen and the main part of the present buildings were developed during the 1960's. The hospital currently undergoing major renovation and extensions. The hospital has recently introduced a specific design guideline called the 'Design Manual' for remodelling and improving the existing waiting areas of the hospital. The Design Manual gives thorough information about patient profiles and describes details regarding requirements and a list of furniture focusing on waiting areas. An example of a patient profile and example of furniture are shown in figure 2.

In an effort to improve patient's waiting experience and create supportive waiting environments at Rigshospitalet, this study is based on the researcher's participation in a professional practice of a real design process and the involvement of clinical nurses. The aims of this study is to investigate the impact of the engagement of clinical nurses during the design process and examine the perspective of nurses toward the concept of hospital waiting areas and user-focused design. The study took place in the ultrasound and nephrology outpatient wards at Rigshospitalet.

This paper provides details of the Rigshospitalet Design Manual and the implementation of the Manual during the redesigning of ultrasound waiting area where, clinical nurses from the ward were involved during the design process. Later, the perspective of nurses, who had been involved in the design process, were investigated by applying the concept of user-focused approach and the concept of hospital waiting areas.

2. Research questions

The specific research questions for this study are framed as follows:

How involvement of clinical nurses influences the design of waiting areas in a Danish public hospital and *how* the specific design guideline 'the Design Manual' can be implemented in the design process across disciplines.

3. Theory

This section provides a framing of the study in relation to theory of user involvement in sub-section 3.1. The design manual that forms the basis for the study as mentioned in the introduction includes a number of patient profiles. These can be seen as examples of 'personas'. The personas method was originally created as part of the development of user interfaces for computer software, but it has been used later also for example in marketing and service design [11]. Sub-section 3.2 provides a short introduction to the theory behind the personas method. The design manual is a communication tool, and can as such be regarded as a 'boundary object', which is an object to be used to bridge the boundary between different disciplines, including the boundary between users and professionals. Sub-section 3.3 provides a short introduction to the theory behind the boundary object construct.

3.1 User involvement

With a paradigm shift of hospital design in the past decade, patients are considered as 'end-users' [12]. Therefore, patients' needs are important aspects during hospital design processes in which the involvement of users can bring benefit and accelerate the design process [13]. A complex project like renovating a hospital has many stakeholders; medical staff and related professions are also considered hospital end-users, and their satisfaction and well-being can have impact on patients' medical outcomes. The involvement of medical staff, especially nurses, can underpin patients' need that has often been abandoned during the design process [6][9][14]. Clinical nurses that are involved in the design process will have more understanding regarding the design limitation and challenges.

The term 'user involvement' is aligned with 'focus on users' [15], 'consulting end-users' [16], 'contacting with system users' [17], and 'participation of users' [13][18]. User involvement can be seen as a general term describing direct contact with users and covering many approaches [13]. For example, in hospital design, users can take active roles in many design activities, but in other approaches, users are involved as providers of information, commentators or objects for observations. The level of user-involvement can broadly be characterized as being somewhere on the continuum from informative through consultative to participative [19].

3.2 Personas

Personas is a critical method for orienting design and development teams to user experience. They are useful when constraints, for example large development teams or diverse users, exclude participatory design methods [20]. Teams can apply Personas for user specific aspects during the design process, making efficient design decisions without inappropriate generalization, and communicating about users to various stakeholders [21][22][23][24][25]. The use of Personas does not require eliminating scenarios or any other method: It is a foundation on which to build scenarios and data collection. It is an infrastructure for engagement. Personas is also a means for communicating data that is collected using other user research methods [26].

Personas are fictional people or characters that are imitating existing person in real life. They have names, likenesses, clothes, occupations, families, friends, pets, possessions, and so forth. They have age, gender, ethnicity, educational achievement, and socioeconomic status. They have life stories, goals and tasks [26]. In order to construct personas to develop design processes, a concrete methodology is employed, for example the organisation of the data collection to develop the main users of particular design project and the development of user profiles and scenarios to facilitate the use of personas [27].

3.3 Boundary object

The term boundary object was developed by Star and Griesemer [28] as a concept of problem solving by means of translation. Boundary objects are described as media or communication between communities [7]. Boundary objects can enhance the capacity of an idea, theory or practice to translate across culturally defined boundaries, for instance between communities of knowledge or practice [29][30]. They can be abstract or concrete objects that arise over time from durable cooperation and understood or misunderstood in equality between the participants.

In term of briefing and design process, boundary objects are divided into five categories [7];

- Repositories (for example, cost databases, part libraries)
- Standardised forms and methods (for example, drawings, handmade sketches, lists of problems, questionnaires)
- Objects, models and maps (for example, slideshows, architectural drawings, and 3 dimensional renderings, fishbone charts, mock-ups)
- Discourses (for example, questioning situations, typical action situations)
- Processing (for example, prototyping, visiting other departments)

Four characteristics to analyze the boundary object in term of briefing and design process are [7][31];

- Boundary objects are not ready made, but objects-in-the-making, need to be created by participants
- Boundary objects have built-in affordances, possibilities for action, interaction instruments
- A facilitator of the events selects the boundary object, develops rule and instructions and guides the workshops
- Boundary objects are used in discrete events, workshop/meeting with a temporary learning space, enable a collaborative design process, enable participants into 'design mode'

4. Methodology

This study was conducted by the first and third author, while the second author supervised the research. The first author collected the empirical data and will, in the following, be called *the researcher*. The third author works as an architect for the hospital and will be called the *hospital architect*. Combination of two methodologies were applied in the study; the first part was document analysis of the Design Manual using interdisciplinary design approach. The second part was the empirical data collection, which was divided into three separate steps as follows;

Step 1 - Brief evaluation of the ultrasound ward. In this step, the researcher evaluated waiting areas of ultrasound and nephrology wards. These evaluations are mentioned below under data analysis. The data from the brief evaluation process narrowed down the requirement criteria for the redesign of the waiting areas. Based on the evaluation results, the hospital architect and the researcher developed a schematic design of the waiting areas using the evaluation data and furniture lists from the Design Manual.

Step 2 - Meeting between researcher, hospital architect and nurses. Two meetings (60 minutes each) took place in the ultrasound ward in September and November 2018. Four nurses participated in the meeting, including a head nurse and three registered clinical nurses. After the meeting, the hospital architect and the researcher further developed the design based on the discussions from the meetings.

Step 3 - Interviews with nurses. The researcher interviewed *six* nurses - four nurses from the nephrology and two nurses from the ultrasound outpatient wards. The interview questions highlighted the concept of hospital waiting areas, user-focused design, the involvement of clinical nurses during the hospital design processes, and context of the Design Manual. Table 1 illustrates details of nurses being interviewed for this study. The nephrology treatment ward had been through a similar process with step 1 and 2, but only the results from step 1 and 2 in the ultrasound ward is presented in this paper.

Table 1. Distribution of nurses interviewed and details regarding the interviews

Hospital	Ward	Number	Date	Duration (minutes)
Rigshospitalet	Ultrasound	2	November, 2018	15-30
	Nephrology	4	January, 2019 February, 2019	45-60
Total		6		

Data analysis - Two steps of data analysis were applied, the first step was analysis of results from the brief evaluation of waiting areas in the ultrasound ward and the meetings between nurses, the researcher, and the hospital architect. The analysis of the brief waiting areas evaluation was done using the criteria from Evaluation Aspect and Requirement of Health-care Facilities [32], the requirements for waiting areas from Rigshospitalet in 2017, and the requirements from the Design Manual. Discussion and notes from the meetings were analysed to develop the design of the waiting areas. The second step was analysis of the interviews with the *six* nurses. Data was transcribed and read line by line to find nurses' opinion regarding: (1) user-focused approach; (2) concept of waiting area; (3) what should be considered for design brief, and (4) concept of design brief. Later open coding was applied to conclude the theme that emerge during the interview [33][34]. Figure 1 illustrates the methodology and timeline of the study.

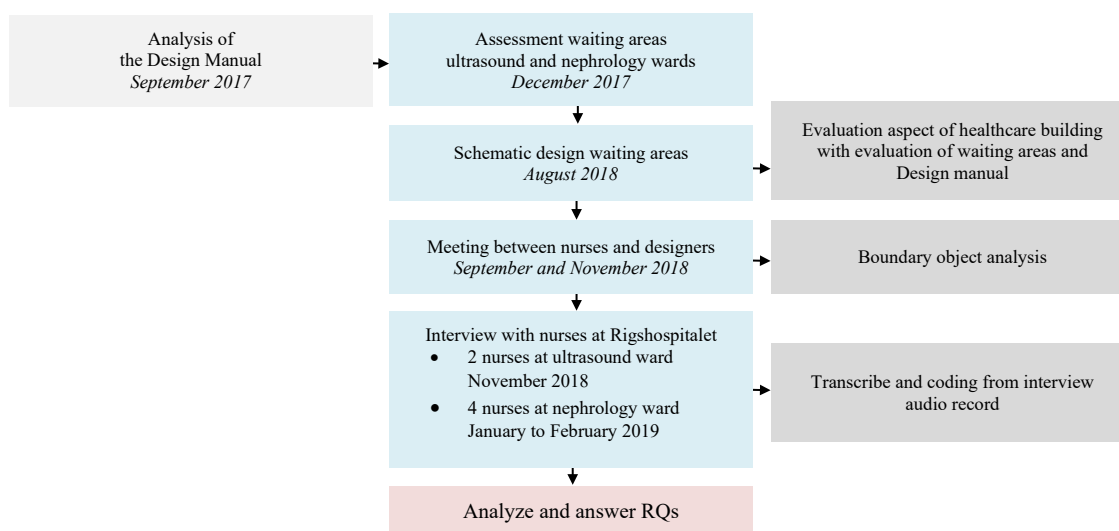


Figure 1. Methodology applied in this study

5. Case description

5.1 Rigshospitalet and redesign of waiting areas

Rigshospitalet's main building was built starting in 1960 with the design of two Danish architects Jørgen Stærmosse and Kay Boeck-Hansen. The hospital was put into service in 1970 after the inauguration of the 16-storey complex buildings. Later, in 1975 a seven-storey south complex was added to the 16-storey building. The central and southern complex is connected by a four-storey building. The redesigning of the waiting areas of the hospital is the ambition from Rigshospitalet, aiming to meet requirement from the Capital Region of Denmark (CRD). The main task of CRD is to excel services of hospitals and healthcare throughout Copenhagen region. In 2015, CRD has launched the concept 'Waiting & Welcoming' together with the implementation of research in improving patient supporting physical environment, care and recovery, which is an on-going process since 2015.

5.2 The design manual

The manual is a specific design guideline created by Rigshospitalet's design team focusing only on waiting areas of the hospital. The manual has been developed through the involvement of users (nurses, clinical staff, patients) and experts (anthropologist researcher and architects). The manual was implemented in November 2017 and the manual provides information as followed;

- Patient needs through user-involvement: one chapter in the design manual provides patient profiles, furniture catalogue, and layout of the waiting areas. Twelve patient profiles cover most of the patients who visit the Rigshospitalet. Furniture catalogue divided into six categories (furniture, lighting, specially adapted inventory, various item, colour and material, inspiration for furniture composition). Figure 2 illustrate a patient profile, list of furniture, and layout of the waiting area.

- Clear guideline for meetings between different stakeholders: meetings should be conducted with a collaboration of different user groups representing medical staff (4 to 8 people), project manager and hospital architect. During the meeting, five topics (user wishes, patient profiles, purchasing process, removal/demolition/ recycling process) will be discussed and clarified.

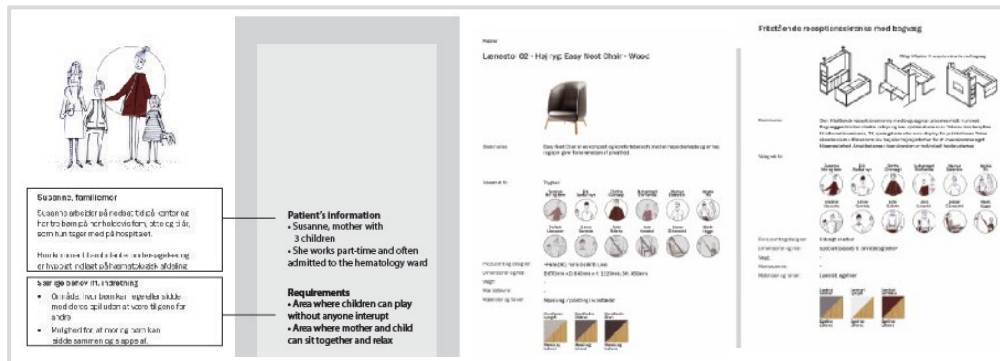





Figure 2. Example of a patient profile, furniture catalogue, and layout of the waiting room from the Design Manual

6. Results

6.1 Brief evaluation of the ultrasound ward

Before evaluating the waiting area of the ultrasound ward, the design manual was sent to the head nurses of the clinic. The nurses looked through the manual and contacted the hospital architect regarding three requirements, including: number of seats for patients; patient profile and requirement of special areas, for example, area for gurneys, children or family. The requests from nurses were included in the evaluation criteria. Table 2 illustrates results from the brief evaluation of the ultrasound ward waiting area.

Table 2. Brief evaluation of the ultrasound waiting area

Criteria	Ultrasound ward	Photos of the waiting areas
1. Reachability	<ul style="list-style-type: none"> • Ward located on ground floor easy access 	 <p>Figure 3: entrance of the ward</p>
2. Accessibility	<ul style="list-style-type: none"> • Waiting area is not suitable for patient in wheel chair or mothers who come with their children or stroller due to limited spaces 	
2. Efficiency	<ul style="list-style-type: none"> • Wide corridor and easy to reach 	 <p>Figure 4: waiting area zone</p>
3. Flexibility	<ul style="list-style-type: none"> • Waiting area is flexible/easy to adapt with no built in furniture 	
4. Safety	<ul style="list-style-type: none"> • Linoleum floor with anti-slippery material • Sufficient amount of light 	
5. Spatial orientation	<ul style="list-style-type: none"> • Waiting area located in the middle of the ward • Patient are not exposed to public while waiting • Clear way-finding with sign 	 <p>Figure 5: patients can lie down at the gurney while waiting in case of emergency</p>
6. Privacy	<ul style="list-style-type: none"> • Not enough space for privacy to discuss private subjects while waiting 	
7. Health and physical well-being	<ul style="list-style-type: none"> • Hand gel, internet wi-fi, phone charger, queuing monitor, variety of drinks, furniture for pregnant lady, and more privacy zone are required • TV is provided for basic information of the hospital and also entertainment 	
8. Architectural feature	<ul style="list-style-type: none"> • Waiting area in the middle of the ward • Three type of seats: plastic chair with metal legs, beds, and wooden bench • Gurneys for acute case • More zoning for patients required • Patients come in couples (husband and wife) more seats for couples and pregnant lady are required 	

This step gives an overview of the waiting area and which architectural elements require an improvement. The waiting area is situated in the middle of the clinic, and patients are not exposed to public space. However, there is a lack of seating for pregnant woman - a comfortable chair with handles - and a couch for couples to sit together. The area

requires zoning for patients, who comes individually or with company. The information was summarized and transferred into meeting agendas to be discussed with nurses.

6.2 Meeting with nurses

Two meetings took place at the ultrasound ward. Before the meeting, the design manual and conclusion of area evaluation were sent to nurses via e-mail. The hospital architect set-up a meeting agenda focusing on: (1) number and type of seats; (2) specific waiting areas, and (3) other topics related to the design of waiting areas. During both meetings, six people attended (four clinical nurses including a head nurse, the hospital architect, and the researcher). The structure of both meetings began with the architect explaining the overall idea of the schematic design and later nurses gave comments regarding the architectural plan and what they would like to add in order to amend the design by following the meeting agendas. Later the architect and researcher took notes and summarized the comments before completing the meetings. Four topics emerged during both meetings.

Improve seating:

- Replace the old seats with new seats from the design manual, nurses selected specific seats from the Design Manual and gave suggestions
- Increase number of seats, 55-60 seats for patients are required, at the moment 51 seats are available but, only 40 seats are usually occupied as patients refuse to sit next to each other.
- Specific seats for pregnant women with handles

Increase patient privacy through the design of the seats and partition:

- Replace gurneys with reclining chairs, replace curtain with partition, and add more seats for family members
- Specific couches where individuals or couples can sit with privacy

Improve quality of waiting area:

- Create zoning with seating in groups, couples, individual, and pregnant women
- Add table lamp to group seating zone and long waiting time zone
- Add water dispenser to the area
- Add handwashing station near water dispenser
- Add writing table at the entrance

Design manual: The design manual enables nurses to select specific patient profiles. Nurses pointed out that a pregnant women profile is lacking in the manual (see example of a patient profile from the design manual in Figure 2). The nurses also identified specific numbers and types of seats to select by looking through the manual (see example of furniture from the design manual in Figure 2). For the lying-down area, nurses mentioned inclining seats, where non-acute patient can also sit. During the meeting, nurses mentioned a type of seat that is similar to a gurney (i.e., reclining seat). Designer and nurses worked together to develop a layout of seating area and zoning. After summarizing each meeting agendas, the hospital architect and the researcher developed the waiting area layout. A schematic design was sent out to nurses, before the architect and researcher finalized the final layout. After the second meeting, the design was finalized.

The meeting with nurses gave specific information that was not investigated during the brief evaluation. Nurses working closely with patients know the exact number of patients, who would visit the ward each day, specific patient's profiles, requirement for furniture, and ideas about zoning. The design manual acted as a catalyst for the meetings, where architects presented the architectural planning and nurses pointed out the furniture from the catalogue, suggested which patient profiles were required, and indicated specific needs. The manual helped accelerating the design process and avoided unnecessary meetings. Figure 6 and 7 illustrates the waiting area at the ultrasound ward before and after the design intervention and collaboration between nurses and architect using the Design Manual for the communication across two disciplines.

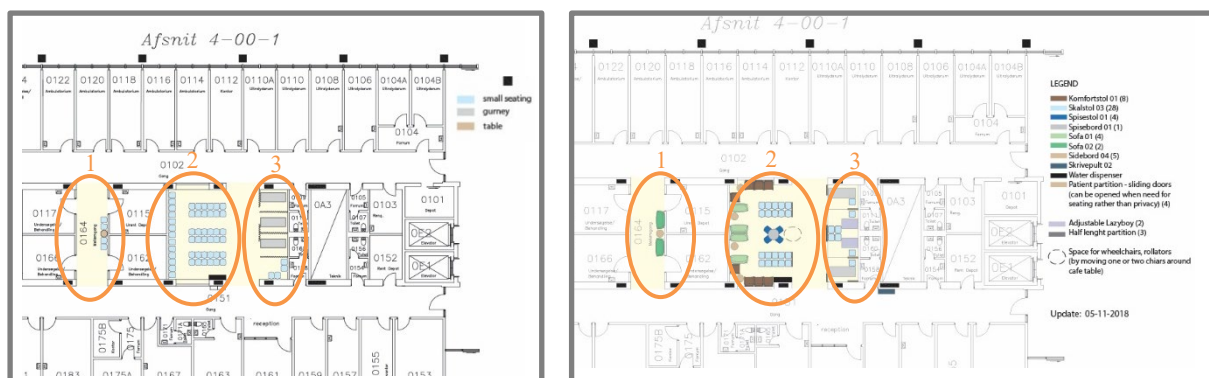


Figure 6 and 7. Plan of the ultrasound ward waiting areas before and after the design intervention

The original waiting area provided 51 seats (figure 6 on the left) including two benches and three gurneys. After the design intervention, the architect provides three zones with a variety of seats including couches and armchairs (figure 7 on the right). Small seats were replaced by couches for patients with long-waiting-time in the first zone. In the second zone, armchairs and couches are provided for pregnant ladies and their company. A round table was installed in the middle of the waiting area with room for patients in wheelchairs. The third zone includes two inclining chairs, which can be adjusted as normal seats are provided together with adjustable couches, and small seats are installed for patient's family and friends. The total number of seats in the new design is 56. However, patients have more seating choices and they can choose to sit in an area with more privacy.

6.3 Interview with nurses

This section explores the perspective of nurses using methods proposed by Fronczek-Munter [8] and Maben et al. [35]. Six nurses from ultrasound and nephrology wards, who had participated in the meetings in step 2, were interviewed. The interview questions were set to explore nurses' understanding of the concept of patient-focused design and the advantage and challenges of the design manual. Four topics emerged from the interviews.

Definition of user-focused approach and patients' needs:

- Involve patients in the design and medical processes of the hospital
- Create mutual design guideline that are aligned with patients' and staff's needs
- Understand individual patients

These findings indicate that nurses understand the concept of the user-focused design approach and see the importance of the involvement of patient and staff during design briefing.

Concept of user-focused design of waiting areas:

- Provide optimal physical comfort for patients
- Provide hospital hygienic standard
- Provide privacy
- Provide information

The nurses underpinned that **privacy** is the most important aspect for design criteria of waiting areas, followed by giving patient information (i.e., waiting time, queue) hygiene, and physical comfort. The interviews highlighted that nurses understand the concept of the user-focused design approach and know that the physical environment has impact on patients' well-being.

Important aspects that should be indicated in a design brief of waiting areas:

- Involvement of clinical nurses
- Number of patients
- Architectural quality
- Hygiene
- Privacy

These findings resemble the concept of user-focused design of waiting areas. The nurses indicated that they pay attention to patients' needs. They added that privacy and services are important for patients, while high architectural

quality is a supplement to medical services, as one nurse said, "The reason that they are here is the treatment and we must do it as good as we can. And if the waiting areas are looking good and clean that is one-plus".

The design manual:

- Give nurses visualization
- Communication tool across disciplines
- Nurses become autonomous
- Give nurses evidence that the area will be amended

The design manual is a cross-disciplinary communication tool. It helps accelerate the design process. Nurses also suggested that it brings benefits, as nurses can be more self-autonomous for a simple design of a waiting area. It also brings the same understanding between architects and nurses. However, the manual needs to be tested regularly in order to keep it up to date. Therefore, the design manual can bring benefits to architects and nurses during the design briefing and it is a useful tool for clinical nurse involvement.

6. Discussion

The design manual is a combination of two concepts, which are user-focused design and personas. The integration of user-focused design and requirements from Righospitalet services for patients were implemented in the design of patient waiting area zones and furniture. Patient profiles represents a combination of the personas method and user-focused design approaches. The patient profiles elaborate the needs of each individual and represent a real person, who comes to the hospital. Nurses can easily identify who, when, what, and how patients will be using the waiting areas by looking through the design manual. As one nurse said, "it helps you visualize what the options are and ideas from the architects, it makes the idea more real".

Another finding is that the design manual was not used for design, but rather as a communication tool across disciplines, especially in Danish hospitals, where involvement of clinical nurses is integrated in design briefing process. Thus, the design manual is a boundary object that transfer research information to design ideas (furniture) and people (patient profile). It acts as a facilitator of the events. The manual gives the same understanding to architects and nurses - in this case meetings between architect, researcher and nurses. The design manual develops rules, instruction, and guides for the meeting. The manual helps nurses visualize and be more realistic of what furniture/solutions will be implemented in the areas, as one nurse said, "it helps you visualize what the options are and ideas from you guys. So, it makes the idea more real. I mean you can talk and describe colour, but when you see the manual you have clear idea about the design". Therefore, the design manual is a useful tool, when there is a cross-disciplinary involvement in the design brief.

7. Conclusion

This paper presented results of an investigation of clinical nurse involvement in design briefing by the use of a specific design guideline (the Design Manual). The research questions framed for this study were: How involvement of clinical nurses influences the design of waiting areas in a Danish public hospital and how the specific design guideline 'the Design Manual' can be implemented in the design process across disciplines. The following provides answers to the research questions.

Clinical nurses give specific information, which sometimes is neglected by architects, for example information about the actual number of patients, specific patient profiles, specific furniture, or zoning. Clinical nurses also have a better understanding about the requirements for the design, but they cannot translate it into design solutions. Therefore, architects fulfil that role and translate nurses' request into design solution or guidelines. The brief evaluation conducted as step 1 in this study gives overall information about the waiting areas, from which architects can understand what needs to be amended and improved. However, the meetings in step 2 and the interviews in step 3 highlighted specific information and illustrated that nurses understand the concept of user-focused design approach. Therefore, the involvement of clinical nurses in an early stage of the (re-)design of hospital spaces, such as clinics and waiting areas, is necessary and should be implemented.

The design manual helps architects and nurses to accelerate the design process. In the interviews, nurses mentioned that it gives them visualisation and understanding of what type of furniture will be implemented in the area. The manual is deployed as a communication tool across disciplines. Nurses can be autonomous for basic designs of the waiting areas, as they can look through the manual and select furniture that align with patients' profiles. Nevertheless, the manual should be updated regularly and be tested in the different clinics throughout the hospital.

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