



Waiting space: Exploring public hospital non-clinical areas through a user-focused design approach

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Waiting space: Exploring public hospital non-clinical areas through a user-focused design approach

Supuck Prugsiganont

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DTU Management
Technical University of Denmark

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Summary

Background:

For most people, going to a hospital is time-consuming and can even become exhausting. This occurs due to a high number of patients in both clinical (clinics, wards, patient bedrooms) and non-clinical areas (waiting areas, hospital cafeterias, hospital parking garages). Many public hospitals are facing overcrowding situations, and their functions are becoming obsolescence or out-of-date. The motivation of this PhD stemmed from my own experiences of going to Thai public hospitals, where the 'overcrowding' situation is viewed as a typical day at the hospital. My curiosity of this phenomenon developed into an ambition to investigate what has caused an overcrowding situation in Thai public hospitals and how with an architect background, I can help alleviate the situation, especially the overcrowding situation and poor physical conditions of public hospital waiting areas.

In the past 30 years, there has been a rise of a new paradigm in hospital design, where the focus of hospital design has shifted from medical treatments to patients' needs. The paradigm shift of hospital design occurred due to the emergence of the evidence-based design (EBD) theory. The theory emphasises that hospital physical environments can have effects on patient health outcomes. The EBD theory has created a movement among hospital designers, planners and facility managers, who aim to amend the physical environments of hospitals. One technique that can lead to the successful implementation of the EBD in hospital buildings is to involve users in the design process. Therefore, the terms 'user-involvement', 'user-focused' design approaches and 'usability' are often used and are major strategies among healthcare designers, facility managers and related professions to create an effective hospital physical environment.

Objective and aims:

The purpose of this PhD study was to investigate Thai public hospitals and to identify the underlying issues causing the overcrowding situation. Moreover, the aim was to observe and to compare public hospital non-clinical areas as well as end-users' experiences to provide insights that can be used to optimise the physical conditions of hospital waiting areas. The investigation was guided by two main research questions;

- (1) What characterises public hospital non-clinical areas?
- (2) How can the experiences and perceptions of Thai/Danish patients and medical staff optimise the design of waiting areas and patient waiting experiences with the aim to integrate a user-focused approach?

Methodology:

The investigation was based on five public hospitals represented by the primary and secondary case studies. The primary case studies are Maharaj Chiang Mai Hospital -Thailand and Rigshospitalet -Denmark. The secondary cases are St Olavs hospital - Norway, Khoo Teck Puat hospital - Singapore and Chulalongkorn hospital - Thailand. The study was conducted through evaluate and to compare non-clinical areas, focusing on the waiting areas of these public hospitals and interviews with patients and staff from primary case studies.

Findings:

The results are presented in five scientific papers in which four core findings were extracted (chapter 6 answers the research questions):

- (1) Six core components that govern the characteristics of hospitals' non-clinical areas which are:
 - structure and organisation of the healthcare systems,
 - hospital management system and services,
 - patients' needs and patient-focused approaches,
 - hospital space management and planning,
 - the physical environment of waiting areas,
 - social structure and cultural setting
- (2) The implementation and the impact of the new paradigm of hospital design
- (3) User-focused and user-involvement approaches during the design process through the specific design guidelines, leading to positive design outcomes.
- (4) A comparison of the differences and similarities of the six core components to provide insights that Thai and Danish hospitals can exchange.

This study contributes to limited knowledge on the impact of hospital waiting areas on patients' experiences. First, not only do the hospital's physical environment and the design of waiting areas have effects on patients' waiting experiences, but the six core-components also have impacts on patients' waiting experiences and care journeys. Second, the findings from the investigation and observations of public hospital waiting areas allowed for developing a waiting area typology of seven types of waiting areas: (1) a large waiting area, (1a) a large waiting area without zoning, (1b) a large waiting area providing zones, (2) a long corridor waiting room with chairs, (3) a small area beside a corridor, (4) a waiting space next to a window, (5) outdoor waiting areas, (6) food places and canteens and (7) an unplanned waiting area. Third, user-involvement is a highly recommended technique that could lead to a high level of usability; however, involvement during the design process should be carried out while being managed properly through structured guidelines.

Acknowledgements

This PhD study has taken three years to complete, and the journey began with an ambitious goal. It was a wonderful three years with many positive experiences and enjoyable moments; however, the journey was not an easy journey due to the tremendous tasks of studying and revising my research, which could not have been done without the support of all the people involved in my PhD project.

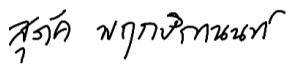
I would like to begin by thanking my supervisory team. I would like to thank my supervisor, Professor Per Anker Jensen, for accepting me as his PhD candidate, for the support and guidance he has offered me along the way and for never giving up on me when I sometimes struggled. His supervision certainly provided me with the strength to pull through this tough research journey. I would also like to thank my co-supervisor, Associate Professor Susanne Balslev Nielsen, for the support and motivation she gave me and for not only encouraging me academically but also for lifting my spirits during rough periods.

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Lastly, I would like to thank everyone who participated in the research data collection process: medical doctors, nurses, patients, hospital planners, architects, facility managers and hospital policy makers. Although I cannot mention your names due to ethical permission, I am very grateful to each one of you for participating in the interviews and providing me with insights into hospital waiting areas.

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September 2020

List of paper 1-5, including my contribution to the papers

This thesis includes and is based on five academic papers. Besides the academic papers, I also disseminate the PhD project into article published in a professional magazine, and into presentations. Both a list of other publications and a list of presentations are included in appendices.

Paper 1

Prugsiganont, S. and Jensen, P.A. (2019) 'Identification of space management problems in public hospital: The case of Maharaj Chiang Mai hospital'. *Facilities*, 37(7/8), pp.435-454.

I initiated and wrote the main part of this journal paper. I conducted data collection and analysis

Paper 2

Fronczek-Munter, A. and Prugsiganont, S. (2018) 'Hospital Architecture Quality - Exploratory observation on three continents', in *Proceeding of S.ARCH 2018 in Venice, Italy, May 2018*, pp. 145-160.

I contributed half of the idea to develop the design of the study and party developed research questions. I participated equally in the data collection at 5 hospital case studies (Norway, Denmark, 2 hospitals in Thailand, and Singapore). I later developed table and architectural drawings. Part of the introduction, theoretical framework, methodology, and resulted were written by me.

Paper 3

Prugsiganont, S., Jensen, P. A., and Poulsen, A.K. (2019) 'Through the eyes of nurses: User-focused design approach for non-clinical areas of public hospitals', in *Proceeding of ARCH19 in Trondheim, Norway, June 2019*.

I initiated and wrote the main part of the paper and conducted all the data collection and analysis.

Paper 4

Prugsiganont, S., Jensen, P. A. (2020) 'Optimizing patient's journey and waiting experience in public hospital: A qualitative study comparing Thailand and Denmark', *Design for Health* (in review process).

I initiated and wrote the main part of the paper and conducted all the data collection. I did the majority part of data analysis.

Paper 5

Prugsiganont, S., Jensen, P. A. (2020) 'Thailand vs Denmark: Improving patient journey and waiting area facilities through patients and staff's opinions', *Facilities* (in review process).

I initiated and wrote the main part of the paper and conducted all the data collection. I did the majority part of data analysis.

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List of abbreviations

CHD	The Centre for Health Design
COVID-19	Corona Virus Disease - 2019
DTU	Technical University of Denmark
EBD	Evidence-based design
GPs	General practitioners
HE	Healing Environment
IPD	Inpatient department
KTPH	Khoo Teck Puat Hospital
NTNU	The Norwegian University of Science and Technology
OPD	Outpatient department
POE	Post Occupancy Evaluation
RQ	Research question
SUB-RQ	Sub research question
WHO	World Health organization

1. INTRODUCTION

In this chapter, I introduce my PhD study by describing my research motivation and background. Then, I describe the research questions that have guided the study. To provide an overview of my study, I describe my research scope and delimitation and then introduce the main research theme. I conclude this chapter by explaining the structure of the thesis.

1.1 MOTIVATION AND BACKGROUND

In an overcrowded waiting area at a large public hospital in Thailand, patients and their families are either standing or sitting. They are all crammed into the same room, squeezed on a bench. The vulnerable group of patients, including elderly and wheelchair-bound patients, is waiting in limbo, not knowing when it will be their turn or how long they will have to wait. At the same time, wheelchairs and stretchers are pushed passed them, creating unpleasant noises. Other patients and staff are walking around them; there is no privacy or any space to relax or withdraw. This is the daily situation at a large public hospital in Thailand.

My motivation to pursue this PhD study stemmed from experiencing the daily situation at Thai public hospitals, which I view as an interesting phenomenon (Creswell et al, 2018). Public hospital areas are always overcrowded. The daily situations in Thai public hospitals raised a question for this PhD study: *What are the issues that caused an overcrowding situation in Thai public hospitals, and how can I, as an architect, elevate the situation using architectural and facilities management knowledge?* Therefore, based on the motivation question, I developed and framed my PhD study. With an architect background and an interest in investigating current physical conditions and situations in public hospitals, I began my PhD study by examining literature that focused on the public health sector and recent hospital design approaches. Interestingly, there has not been any comparison study between Thai and Danish public health sectors or of hospital architecture.

The healthcare industry is becoming increasingly important around the world due to the rise in the elderly population, including in Thailand. The country needed to prepare for the increased needs related to medical treatment. Consequently, the Thai government allocated 136 billion Baht (3.89 billion Euros) for healthcare services, and 109 billion Baht (3.12 billion Euros) will be allocated to the Ministry of Health and Public Health; this budget also includes the construction of healthcare facilities and hospitals (Thai budget in brief fiscal year, 2019). When I began my PhD project in 2017, the budget allocated to Thai public health was 63 billion Baht (1.8 billion Euro). Hence, the government is constantly increasing a long-term budget (2017-2025) for healthcare and public health services to improve the country's public health services infrastructure (Thailand budget in brief fiscal year, 2019).

Similar to Thailand, healthcare in Denmark is developing fast as the country is also dealing with an ageing society. In 2007, Denmark launched a major healthcare structural reform proposed by the Danish Health and Medicine Authority (Sundhedstilsynet, 2007). The aim of Danish healthcare reform is to put patient's needs into focus and to improve quality of care (Danske Regioner, 2020). The restructuring included a renewal of Danish hospitals – renovating existing buildings and building new hospitals (Andersen, 2016). In 2008, the

Danish government allocated a large budget of 8.98 billion Euro for 43 hospital projects, of which 16 of the 43 projects aimed to build new hospitals (Andersen, 2016; Olejaz et al., 2012).

Along with the rise in the healthcare industry throughout the world, including in Thailand and Denmark, a new paradigm of hospital architecture has become one of the most important aspects of the hospital design process (Fronczek-Munter, 2016). The paradigm shift in hospital design occurred due to the emergence of the Evidence Based Design (EBD) theory (Hamilton, 2003; Malkin, 2008; Ulrich et al., 1984; Ulrich, 1991; Ulrich et al., 2004). The focus of hospital design and the physical environment has shifted from medical treatments towards users' needs (Fronczek-Munter, 2016; Huisman et al., 2012; Ulrich, 2010; Zadeh et al., 2018). Hence, the term 'EBD' refers to a hospital's built environment that can contribute to positive patient health outcomes – both physical and mental health (Ulrich, 1984; Ulrich et al., 1991; Hamilton, 2003; Ulrich et al., 2004; Becker & Parsons, 2007; Ulrich, 2006; Connellan et al., 2013). One technique that can lead to the successful implementation of the EBD theory in hospital building is to involve users in the design process. Therefore, user involvement, user-focused and patient focused-design approaches are often used as major strategies among healthcare facilities managers, hospital planners and related professions to create an effective hospital physical environment (Becker, Bonajuto & Bilotta, 2011; Becker et al., 2007; Ulrich et al., 2004; Huisman et al., 2012).

Recent research on a new paradigm of hospital architecture and patients' clinical outcomes has been well-established in the last 30 years, and the concept of EBD and a healing environment (HE) has been introduced to healthcare designers, researchers and related professions. Recent studies have mostly focused on the design of patient clinical areas and patients' bedrooms (Patterson et al., 2017; Ulrich et al., 2008; Lavender et al., 2015; Maben, et al, 2015). Moreover, recent studies have clearly indicated that a hospital's physical environment has an impact on patients' physical and mental health outcomes, especially patients' stress levels (Ulrich 1991; Ulrich et al., 2008; Huisman et al., 2012). Fogarty and Cronin (2008) and Yoon and Sonneveld (2010) stated that patients in hospital waiting rooms are usually stressed or have anxiety, which occurs due to the lack of control or hope for an improvement in their health. Hospital non-clinical areas and waiting areas play a crucial role in patient stress levels and their mental health (Anåker et al., 2019; Jiang et al., 2017) because they are part of the medical process and the patient care journey (Jiang et al., 2017; Pati & Nanda, 2011); however, few studies have focused on the design of non-clinical areas and patient waiting experiences. *Therefore, little is known about the design of waiting areas and its contribution to patients' health outcomes, including the patient journey.* This statement aligns perfectly with the initial question and my research motivation. No prior study has investigated or compared hospitals' physical environments of non-clinical area/waiting areas between Thai and Danish public hospitals. Therefore, a comparison study between two large public hospitals may yield findings that can optimise patient waiting experiences, their care journeys and the design of waiting areas. Moreover, the investigation of the Danish healthcare system and public hospitals could provide the opportunity to identify prospect solutions for underlying issues that cause overcrowding in Thai public hospitals.

1.2 RESEARCH QUESTIONS

This PhD study has five aims. The first aim is to investigate the causes of overcrowding in a public hospital as well as how to alleviate the situation through architectural and facility management knowledge. Second, information will be provided that can be used to improve the physical environment of public hospital waiting areas. Third, the concept of the user-focused and user-involvement approach that is implemented in hospital design process will be investigated. Fourth, end-users' (patients and staff) experiences and perspectives will be compared, and useful information that can optimise the design of public hospital waiting areas and improve patient care journeys will be provided. Fifth, the impact of cultural differences between Thailand and Denmark and whether the information can be applied for the future design of public hospital waiting areas will be determined. Thus, for each step of the study, four sub-questions were framed to guide the investigation. The questions were framed as follows.

RESEARCH QUESTION 1: What characterises public hospital non-clinical areas?

To guide my investigation further, each question is supported by two sub-questions (SUB-RQ), as follows:

SUB-RQ 1: What is the current situation in large Thai public hospitals, and how does the current situation effect the organisation and space management of non-clinical areas in Thai public hospitals?

SUB-RQ2: What are the typology and architectural characteristics of public hospital waiting areas?

RESEARCH QUESTION 2: How can the experiences and perceptions of Thai/Danish patients and medical staff optimise the design of waiting areas, with the aim of integrating a user-focused approach?

Similar to research question 1, this question is also supported by two SUB-RQs, as follows:

SUB-RQ 3: How can the implementation of a user-focused approach through the involvement of clinical nurses support the design process of hospital waiting areas?

SUB-RQ 4: Which aspects of patients' and medical staff's experience and perceptions of hospital waiting areas can be used to optimise patients' waiting experience and care journey? Further, are there similarities or differences between the experiences and perceptions of Thai and Danish patients and medical staff of public hospital waiting areas?

The relationships between the research questions, sub-questions and the five papers are shown in table 1-1. *Research question 1* is answered by Paper 1 and Paper 2. *Research question 2* is answered by Paper 3, Paper 4 and Paper 5. Moreover, Paper 5 answers part of research question 1.

Table 1-1: Overview of papers included in this thesis and the research questions to which they are related

Paper	Reference	Key words	Research aim of the paper	Add to RQs	Add to SUB-RQs
1 Journal, published	Prugsiganont, S., & Jensen, P.A. (2019). Identification of space management problems in public hospitals: The case of Maharaj Chiang Mai hospital. <i>Facilities</i> , 37(7/8), 435-454.	Public sector, Planning, Architecture	To gain a better understanding of the Thai healthcare system and situation in public hospitals and to investigate how the overcrowding situation affects hospital space management and planning, especially hospital non-clinical areas	RQ1	SUB-RQ 1
2 Conference, published	Froneczek-Munter, A., & Prugsiganont, S. (2018). Hospital architecture quality - Exploratory observation on three continents. In <i>Proceeding of S.ARCH 2018 in Venice, Italy, May 2018</i> , pp. 145-160.	Walk-through evaluation, Hospital architecture, Non-clinical areas	To investigate the characteristics and the arrangement of physical environments, including space management in public hospital non-clinical areas, focusing on public hospitals on three different continents	RQ1	SUB-RQ 2
3 Conference, published	Prugsiganont, S., Jensen, P. A., & Poulsen, A.K. (2019). Through the eyes of nurses: User-focused design approach for non-clinical areas of public hospitals. In <i>Proceeding of ARCH19 in Trondheim, Norway, June 2019</i> .	Nurse involvement, design manual, Waiting areas, Public hospital, Denmark	To investigate clinical nurse involvement in the hospital waiting area design process through specific design guidelines and to explore the perspectives of nurses towards the concept of the user-focused design approach that is implemented in a public hospital waiting area	RQ2	SUB-RQ3
4 Journal, in review process	Prugsiganont, S., & Jensen, P. A. (2020). Optimizing patients' journey and waiting experience in public hospitals: A qualitative study comparing Thailand and Denmark. <i>Design for Health</i> (in review process).	Public hospitals, Waiting areas, Patient experience, Patient journey, Waiting experience, Thailand, Denmark	To compare Thai and Danish patients' care journeys and waiting experiences when receiving care in public hospitals To explain from patients' perspectives opportunities to optimise their journeys and to elaborate on the social and cultural elements of their needs	RQ2	SUB-RQ4
5 Journal, in review process	Prugsiganont, S., & Jensen, P. A. (2020). Thailand vs Denmark: Improving patient journeys and waiting area facilities through patients' and staff's opinions. <i>Facilities</i> (in review process).	Thailand, Denmark, Public hospital, Waiting area, Patient and medical staff opinions and experiences	To explore and to compare patients' and medical staff's experiences and opinions towards waiting areas at Thai and Danish public hospitals	RQ2 and partly RQ1	SUB-RQ4 and partly SUB-RQ2

1.3 RESERCH SCOPE DELIMITATIONS

This study focused on investigating the problems that caused the overcrowding situation in a Thai public hospital and on providing useful information that can be implemented to improve the physical environment of public hospital waiting areas, patient experiences and patient care journeys. Another study aim was to compare the differences and similarities between Thai and Danish public hospital waiting areas' physical environments, including patients' and medical staff's perspectives.

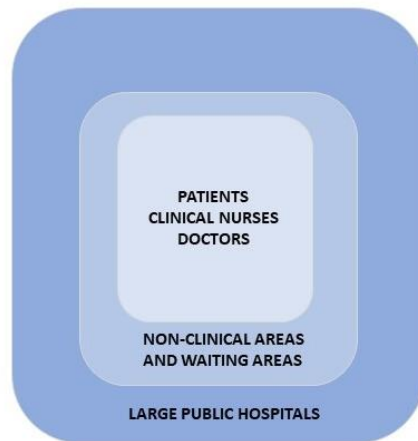


Figure 1-1: Research scope and delimitations

The focus of this PhD study included three points of the research scope and delimitations (Figure 1-1). First, according to the study's main purpose, only public hospitals are included for the observations of both primary and secondary case studies. Although Thailand and Denmark provide public and private healthcare services, private healthcare services only provide medical treatments to those who have private insurance. In contrast, Thai public or government hospitals provide services to all citizens due to the implementation of a universal coverage scheme (Jongudomsuk et al., 2015). A similar approach was applied to Denmark. The aim of this PhD study was to provide outcomes that can be achieved at hospitals that serve everyone. Second, the evaluation and observations were carried out mainly at the hospitals' non-clinical areas and waiting areas. Evaluation guidelines and assessment criteria for hospital clinical areas are stricter and are based mainly on the function of the clinic (World Health Organization - WHO, 2020a). Therefore, the design of clinical areas is not easily adaptable or changed to fulfil end-users' needs. On the contrary, the design of non-clinical areas is more flexible and can be adjusted according to end-users' suggestions as the areas are not directly involved in medical procedures and treatments. Therefore, the evaluation of clinical areas was not included in the thesis. Third, the recruitment of participants in user involvement and user focus studies, where I only recruited end-users of hospital waiting areas. Therefore, in this thesis, I included only patients, clinical nurses and doctors as these three groups of participants represent the end-users of waiting areas (Shackel, 2009). Although clinical nurses and doctors are not directly

waiting area end-users, they can provide insights that are often overlooked by hospital planners or facility managers (Forgaty & Cronin, 2008; Canadian Nurse Association, 2009). To conclude, the scope and delimitations of this thesis allowed for developing the main research themes and formulating the technique for the empirical study and data collection. The thesis only focused on investigating public hospitals, non-clinical waiting areas and patients' and medical staff's experiences and perceptions.

1.4 INTRODUCING THE MAIN RESEARCH THEME

The research focus, questions and scopes were developed into four research themes (Figure 1-2). The main research themes were later explored, and the four main literature frameworks are presented in chapter 2. These four themes were implemented throughout the entire study, including when framing the methodology and selecting tools and techniques for data collection (chapter 3), presenting findings (chapter 4), supporting and forming arguments for discussion (chapter 5) and presenting the conclusion (chapter 6). The main research themes are listed in the sub-sections as follows.

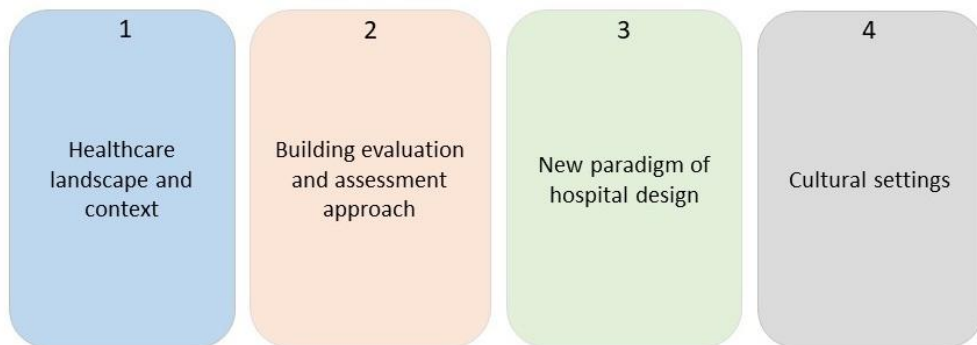


Figure 1-2: The four main research themes

1.4.1 Healthcare landscape and context

To provide an overview and understanding of this PhD's primary case studies, the structure and organisation of the Thai and Danish healthcare systems were reviewed. Thai and Danish public healthcare services both employ the universal coverage scheme (Jongudomsuk et al., 2015; Ministry of Danish Health, 2017); however, Thailand and Denmark have different approaches in managing public healthcare services (Limwattananon et al., 2012; Olejaz et al., 2012). In chapter two, I elaborate on and review the literature, focusing on how Thailand and Denmark organise their public health sectors and how each country manages its public healthcare services. The first research theme provided me with a basic idea regarding how I could begin the observations of the two primary case studies - Maharaj Chiang Mai Hospital and Rigshospitalet. Later, the information on the public healthcare services supported the data analysis and discussion chapter.

1.4.2 Building an evaluation and assessment approach

To frame a suitable technique for data collection, I examined the theory of space management and strategic space development (Jensen, 2006; O'Mara, 1999). I then researched prospect tools and methods that can be used for hospital building evaluations. Various methods and tools can be implemented to evaluate healthcare facilities, and one of the most well-known techniques is a Post-Occupancy Evaluation (POE) (Kalantari & Snell, 2017; Blakstad et al., 2008; Bordass & Leaman, 2005; Preiser, 1989, 2002; Preiser, 1995). In chapter two, I elaborate on the techniques and tools that can be applied for a POE in hospital non-clinical areas. I also adopted the evaluation focus flower model (Fronczek-Munter, 2016) and then selected the suitable tools and methods for the evaluation of all my case studies (Maharaj Chiang Mai hospital, Rigshospitalet, St Olavs hospital, Khoo Teck Puat hospital, Chulalongkorn hospital). The second research theme provided me with the overall ideas for space management, for the building evaluation technique for empirical data collection and for the data analysis.

1.4.3 New paradigm of hospital design

Since the 1990s, there has been a new development in the research on the impact of a hospital's physical environment and patient health outcomes (Ulrich et al., 2008; Connellan et al., 2013; An ker et al., 2019). Therefore, the third research theme focused on the new paradigm of hospital design, where patients are the centre of attention in the design of a hospital (Martin et al., 1990; Ulrich, 1991; Ulrich et al., 2008; Huisman et al., 2012). I discussed the terminologies related to the emergence of the new paradigm of hospital design, which includes the EBD, a healing environment, a user-centred design, a user-focused approach, usability and user-involvement. I then discuss the impact of hospital design on patient health outcomes (both physical and mental health), which led to the research gap for this PhD study. Moreover, I provide an overview of hospital waiting areas, the psychology of waiting in lines and how to consider users' needs to optimise the design process. The third research theme provided me information that I used during the data analysis, where I formed the argument for the study. Part of this main research theme facilitated the data collection step, such as techniques and tools for the user-involvement approach.

1.4.4 Cultural settings

Part of the study is a comparative study in which I investigated the differences and similarities between Thailand and Denmark public hospitals and end-users' perceptions towards hospital waiting areas. For Thailand, I focused on Thai national characteristics (Riratanaphong, 2014), and for Denmark, I concentrated on Danish national identity and characteristics (Grenness, 2003; Østeg rd, 2012) to understand the overview of the cultural value of both countries. For the comparison study and an analysis of the cultural settings of both countries, I applied a more structured and concrete approach. Therefore, I applied the six cultural dimension theory (Hofstede, 1997; Hofstede, 2001; Hofstede et al., 2010; Hofstede, 2011).

1.5 STRUCTURE OF THE THESIS

This paper-based thesis consists of five papers and the synopsis of the study, the link between the core findings and the two research questions framed for this study. Moreover, the findings answer the sub-questions and provide insights that can be used to inform hospital planners and facility managers for the future planning of public hospital waiting areas. Figure 1-3 provides a brief overview of each chapter.

The synopsis is structured as follows.

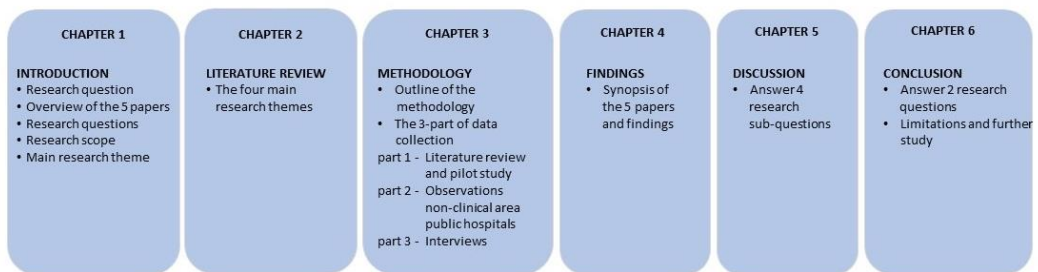


Figure 1-3: Synopsis of each chapter of the thesis

- Chapter 1:** Introduction of the thesis, research questions, sub-questions, scope of the thesis and delimitation. I also introduce the four main research themes, which were used as the primary literature frameworks in chapter 2.
- Chapter 2:** Literature review, where I provide four core literature frameworks, which include the healthcare landscape and context, the building evaluation and the assessment approach and the new paradigm of cultural setting. I also describe how I applied each literature framework to this PhD study.
- Chapter 3:** Outline of the methodological approach and presentation of the three chronological parts of the methods: Part 1 (literature review and pilot study), Part 2 (observation and evaluation of non-clinical areas and hospital waiting areas) and Part 3 (interviews with patients and medical staff).
- Chapter 4:** Brief summary of each paper (5 papers).
- Chapter 5:** Discussion and answers to research sub-questions.
- Chapter 6:** Conclusion and answer to research questions. Moreover, I provide my contributions to the literature and implications for practice. I also provide recommendations for further research and my reflection on the pandemic situation (COVID-19) and the design of public hospital waiting areas.

2. LITERATURE REVIEW

This section presents a background of the literature that helped me frame the research questions, establish empirical data collection techniques and tools, and analyse collected data. I implemented four literature frameworks for this study (Figure 2-1), which are: (1) the healthcare landscape and context of the primary case studies - Thailand and Denmark, (2) building evaluation and assessment approach, (3) the new paradigm of hospital design approach and (4) the social structure and culture of the primary case studies.

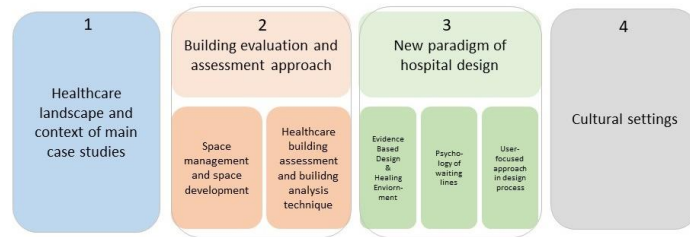


Figure 2-1: Literature background employed in this study

2.1 HEALTHCARE LANDSCAPE AND CONTEXT OF THE MAIN CASE STUDIES - THAILAND AND DENMARK

This section provides information regarding the structure of the healthcare system in Thailand and Denmark (Figure 2-2). This section begins with an introduction of the structure of the Thai healthcare system and later describes the structure and organisation of the Danish healthcare system. It concludes with how this information provided me with an understanding of the general context and background of their healthcare services. Moreover, a review of the Thai and Danish healthcare systems helped me determine how to data analysis could be approached.



Figure 2-2: First framework of literature background

2.1.1 Overview of the Thai healthcare system

Healthcare in Thailand belongs to the public sector. Since 2002, Thailand has been implementing a universal health coverage approach (Limwattananon et al., 2012), and before 2002, it was mandatory for citizens to have healthcare insurance in order to receive medical and healthcare services (Tangcharoensathein et al., 2009). In 2001 more than 30% of the population was still uninsured. Moreover, accessibility to healthcare services was challenging for most of the rural population (Limwattananon et al., 2012). After the parliament passed the universal health coverage scheme known as National Health Security, every citizen was able to receive quality essential health services (Jongudomsuk et al., 2015). However, healthcare reform was required as a counterpart to the launch of the universal coverage scheme (Jongudomsuk et al., 2015).

Universal health coverage had brought medical healthcare services for 47 million of the population who were not insured by the three types of coverage schemes (civil servant medical benefit scheme, social health insurance scheme, and private insurance) (Limwattananon et al., 2012). These schemes only applied to those who were employed by the public or private sectors and wealthy citizens. According to a World Health Organization (WHO) report, relatively high budgets of health services were subsidised to cater to poor universal health coverage members rather than rich ones (Jongudomsuk et al., 2015). Therefore, the implementation of the Universal Coverage Scheme brought increased access to medical services for every citizen, especially the poor (Jongudomsuk et al., 2015; Limwattananon et al., 2012; Limwattananon et al., 2015).

With the aim to improve healthcare services as a counterpart to universal health coverage, the Ministry of Public Health attempted to establish community healthcare facilities in rural areas. However, this became challenging for the Ministry of Public Health as most of the population still believed in hospital-based care (Jongudomsuk et al., 2015). Universal health coverage members are eligible to receive free medical treatment at any public hospital; therefore, most prefer to go directly to large public hospitals as they believe these hospitals provide better healthcare services.

As mentioned earlier, Thailand has been attempting equal healthcare services to all citizen. The country has a long history of trying to decentralise their healthcare management system by transferring responsibility of primary and secondary healthcare services from the Ministry of Public Health to local municipalities (local elected government units). In 1999, three years prior to the launch of the universal health coverage scheme, the Decentralisation Act was introduced; however, the Act was slow and unsuccessful. A decade after the Act was launched, only 46 out of the 9,786 health centres were devolved to local municipalities. This happened due to many underlying issues which includes the social structure of Thailand; lack of readiness, capacities and funding; and conflict of interest. Multiple reasons (as mentioned earlier) contributed to the lack of progress in developing quality local healthcare services. Based on the WHO report, three factors that hinder the development and distribution of community healthcare services were: (1) shift in central government priorities, (2) unwillingness of the Ministry of Public Health management to devolve authority to local municipalities and (3) the lack of readiness on the part of local municipalities to assume responsibilities (Jongudomsuk et al., 2015; Limwattananon et al.,

2012). The weak role of the municipal health system led to failure in developing quality local healthcare services. Therefore, there is a mismatch between available local healthcare services and the medical needs of the poor due to the universal coverage scheme.

2.1.2 Overview of the Danish healthcare system

Danish healthcare services and the hospital sector primarily belong to the public sector. Both outpatient clinic and hospitalisation belong to the Danish government (Andersen, 2016). The Danish healthcare system has always implemented universal health coverage, that is, all citizens have equal access to free and quality healthcare services (Olejaz et al., 2012). Universal healthcare access is the underlying principle of Denmark's health law, where healthcare services are funded by general taxes (Olejaz et al., 2012). The healthcare management system is decentralised, which means that the regional councils in the five regions of Denmark are responsible for the hospitals in their respective regions (Olejaz et al., 2012). The regions own, manage and finance hospitals and healthcare primary services (specialised clinics, physiotherapists, and general practitioners). They are also responsible for financing and delivering nursing home care, health visitors, dental services, school health services, home help and treatment for drug and alcohol abuse (Olejaz et al., 2012).

In 2007, Denmark launched a major structural reform of the healthcare system, which was proposed by the Danish Health and Medicines Authority (Sundhedstilsynet, 2007). The proposal was to create super hospitals which means that specialised clinics are centralised to improve quality of care (Sundhedstilsynet, 2007). One of the purposes of the initiative was to put patient needs at the forefront by improving patient care coherency, patient safety and quality of care (Danske Regioner, 2020). According to Sundhedsstilsynet (2015), the restructuring of the Danish healthcare system in 2007 is the most comprehensive healthcare reform in modern times.

The restructuring included renewal of Danish hospitals, that is, renovating existing buildings and building new hospital projects. In 2008, the government established a foundation called the Quality Foundation (Kvalitetsfonden) to finance the hospital renewal project. A total budget of 8.98 billion Euros was allocated for 43 renewal projects while 6.4 billion Euros was invested in 16 new hospital projects (Simonse, 2016; Olejaz et al., 2012). The hospital renewal process is expected to be completed in 2020. The renewal projects are of two types: (1) greenfield projects, that is, entirely new hospital buildings often located in new sites and (2) the extension and modernisation of existing hospitals (Fronczek-Munter, 2016; Olejaz et al., 2012).

The goal of this complete restructuring is to ensure nationwide access to modern health services and to improve quality across the entire healthcare system. New hospital projects are based on collaboration with research institutes and private businesses in the healthcare field (Olejaz et al., 2012). A primary goal of the new hospital design is flexibility, where hospital functions and capacity can be adjusted, expanded or reduced depending on future demand for treatment and care (Olejaz et al., 2012). It is apparent that Denmark is preparing for further development of its healthcare services to meet the demand. However, the country still ensures equal access to quality healthcare services.

2.1.3 An overview of Thai and Danish healthcare systems

Thailand and Denmark share similarities and, yet, are also different in how they organise and structure their healthcare services. While they both employ universal health coverage, they differ in their healthcare management. Thailand has been struggling to decentralise and devolve some responsibilities from the Ministry of Public Health to local municipalities. However, Denmark has been undergoing major healthcare system restructuring, resulting in 43 renewal projects and 16 new hospital projects.

This overview of the healthcare systems of Thailand and Denmark provided me a basic idea of how I can begin my observation of the two main case studies: Maharaj Chiang Mai hospital (Thailand) and Rigshospitalet (Copenhagen, Denmark). I approached each hospital differently from the perspective of explorative observatory approach (Creswell, 2014; Saunders et al., 2019). For Thailand, based on the literature background and the underlying issues in the country regarding its healthcare management system, I expected to witness chaos and overcrowding due to the mismatch between available healthcare services and the need for medical treatment. On the contrary, for Denmark, based on its healthcare system, I anticipated that the daily situation at Rigshospitalet would still be 'busy' but not chaotic and overcrowded. Moreover, this overview also supported me during the data analysis process. The analysis will be based on my understanding of the structure and organisation of the healthcare systems of the two countries (Saunders et al., 2019).

2.2 BUILDING EVALUATION AND ANALYTIC APPROACHES

Building evaluation and assessment (Figure 2-3) was used as the main tool for evaluating the case studies, which includes Maharaj Chiang Mai hospital and Rigshospitalet (the two main case studies), St Olavs hospital (Trondheim, Norway) Chulalongkorn hospital (Bangkok, Thailand) and Khoo Teck Puat hospital (Singapore). I define space management and development in large buildings to provide an overview of how typical hospital buildings are developed. Then, I explain the building evaluation and analytical techniques that were employed in this PhD study. I end the section by outlining how I have applied building evaluation and analytical techniques in this PhD study.

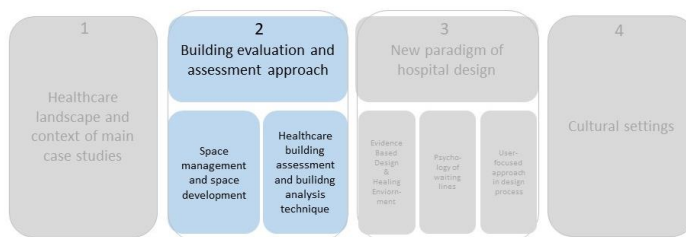


Figure 2-3: Second framework of literature background

2.2.1 Space management and space development

To be able to understand the development of buildings, including hospital buildings, I examined the theory on space strategies. In most public or private organisations, policies and strategies for their facilities play an important role in how each organisation plans and manages its facilities in the short and long term. Space management and space adaptation can support future development of a company's facilities and buildings. Jensen (2006) states that practical management and the decisions regarding space are an indication of specific policies and certain strategies. Two core components that each organisation should consider for their space planning are strategic importance and adaptation of space (Jensen, 2006).

2.2.1.1 Strategic importance of space

Facility and space management strategies of each organisation are not considered priorities by the management team (Jensen, 2006). According to O'Mara (1999), most American organisations make major decisions on strategic planning for their spaces every three to five years. This happens when new building projects are initiated, during buying and selling of buildings and at the commencement or end of major rental arrangements. In these situations, the strategic importance of space decisions is obvious, because the decision will have a serious effect on the organisation and its long-term economy, and on collaborating partners. One of the most important aspects in strategic space planning is 'space' itself as space is considered a physical frame of the company. Space planning can have a significant effect on an organisation's economic situation. Therefore, failure in space management can lead to increased expenses, low productivity, and low-satisfaction level from employees and collaborating partners (Jensen, 2006). Nonetheless, space or physical environment does not get a lot of attention from the top management team; space is usually taken for granted.

Jensen (2004) added that it is important to distinguish between generic strategic and current strategic areas. Generic strategic areas include strategic space planning for long-term development of the organisation that does not require much attention from the top management. On the contrary, current strategic areas include strategic planning for long-term development of the organisation that requires frequent attention from both internal and external parties. The physical environment or 'space' is usually characterised as a generic strategic area. However, to create a successful strategic space plan, both generic and current strategic area planning should be implemented.

2.2.1.2 Strategic adaptation of space

Jensen (2006) states that it is crucial to ensure the long-term adaptation of space to an organisation's need for development. Each organisation chooses space adaptation plans based on several factors, including their economic situation. Three space adaptation strategies that are typically used by American companies are incremental, standardised, and value-based (Becker & Steele, 1995; Jensen, 2006; O'Mara, 1999).

- **Incremental** - Incremental space development means that the adaptations of space are made only in small steps when necessary, and extra space is usually rented to avoid major capital investments. This strategy is mostly applied by companies under significant economic uncertainty, such as start-up companies or organisations in an unstable economic situation. Becker and Steele (1995) add that space is the organisation's second most expensive resource. Jensen (2006) stresses that the strategy can also be applied by companies under rapid development, where extra space is urgently acquired. This strategy is also often used in markets with rapid economic or technological changes.
- **Standardisation** - Standardisation of space development means that the organisation bases its design and decision of space management on a strict long-term plan. This strategy of space development is usually applied by large companies with a certain and steady economic growth rate. Therefore, the company is able to precisely predict and plan its long-term space management and development. The strategy often involves standardisation of design processes and outcomes.
- **Value-based** - Value-based space development means that the organisation uses its building to promote its position and identity. The strategy can be implemented by creating an optimal physical environment for production processes and utilizing the building as a symbol for the organisation. This strategy is usually applied by companies experiencing medium uncertainty, such as start-ups, companies with large profits, companies that survived major crises, and those with new management teams aiming to implement major changes.

Strategic space management and planning allow organisations to predict future development and have a certain amount of flexibility. Well-planned space management can lead to significant cost saving, a high-satisfaction level, and increased productivity. These three types of space development strategies provide me with the knowledge of how hospital buildings can be organised and developed.

2.2.2 Building evaluation method employed in this PhD study

As mentioned in Section 3.2, I applied the building evaluation method as a primary empirical data collection method. Cold (2012) explains the importance of building assessment and evaluation through three aspects. First, understand and experience the context of the place yourself (recognition). Second, observe other's experience and use of place (control). Third, discuss with and inform other experts about the evaluation of places (professional information). To conclude, the building evaluation technique provided me with information on how buildings were developed, their current physical condition and context, and how spaces were used by other groups of users.

Several methods and tools are available for the implementation of building evaluation (Fronczek-Munter, 2016). One of the most effective building evaluation techniques is Post Occupancy Evaluation (POE) (Fronczek-Munter, 2016). However, POE comprises of multiple themes and guidelines depending on the focus of the evaluation (Fronczek-Munter, 2016). For example, POE on a building's energy consumption or architectural quality apply different techniques and guidelines. In the next section, I provide an overview of POE and the evaluation focus flower model, which provided details of evaluation techniques depending on the focus of the evaluation.

2.2.2.1 Post occupancy evaluation and evaluation focus flower model

- **Post Occupancy Evaluation** - POE is the most popular building assessment method among building inspectors and planners (Preiser et al., 1988; Preiser, 1995, 2003; Preiser et al., 2005). 'Post occupancy' refers to the fact that the building has already been occupied and is ready for evaluation (Preiser et al., 1988). Therefore, evaluation is used as a tool to acquire feedback from building users or experts to improve the building's condition (The Center for Health Design, 2015). According to the definition of Preiser et al. (1988), Preiser (1989, 1995), POE is 'the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time'.

Preiser et al., (1988); Preiser (1995, 2003) and Blakstad et al., (2008) describe the three levels of POE. **The indicative POE** refers to quick, walk-through evaluations, involving structured interviews with key personnel, group meeting with end-users and inspections. **The investigative POE** refers to in-depth evaluations with interviews and survey questionnaires, and photography, video recordings and physical measurements. **The diagnostic POE** is a longitudinal and cross-sectional evaluation study of performance aspects that is comprehensive and includes many variables, taking a research approach. The result is knowledge from state-of-the-art case descriptions.

Fronczek-Munter (2017) states that the traditional POE usually focuses on technical building performances. However, Jensen (2012) suggests that the combination of both technical and user-oriented performance of building evaluation could lead to tremendous improvement of building. As several techniques and methods can be applied for POE depending on the

focus of evaluation, I looked into the evaluation focus flower model, which was developed by Aneta Fronczek-Munter (2016) (who is also the co-author of Paper 2).

- Evaluation focus flower model** – This is a model elaborating the evaluation methods that can be used in POE depending on the focus area of the study (Fronczek-Munter, 2013). Over 150 POE techniques are available worldwide (Blakstad et al., 2008; Bordass, 2006; Bordass & Leaman, 2005; McDougall et al., 2002; Stevenson & Leaman, 2010). The model (Figure 2-4) illustrates an overview of methods, which are grouped and organised into the ‘evaluation focus flower’. As similar techniques are grouped into the same flower petal, the model helps the evaluator find the right evaluation method fitting the focus area of the study. Fronczek-Munter (2013) states that the model was built on three main areas based on the principle introduced by the ancient Roman architect, Vitruvius (80-15 BC). The three main areas are *venustas* – as beauty/form, *utilitas* – as utility/usability and *firmitas* – as durability/technology.

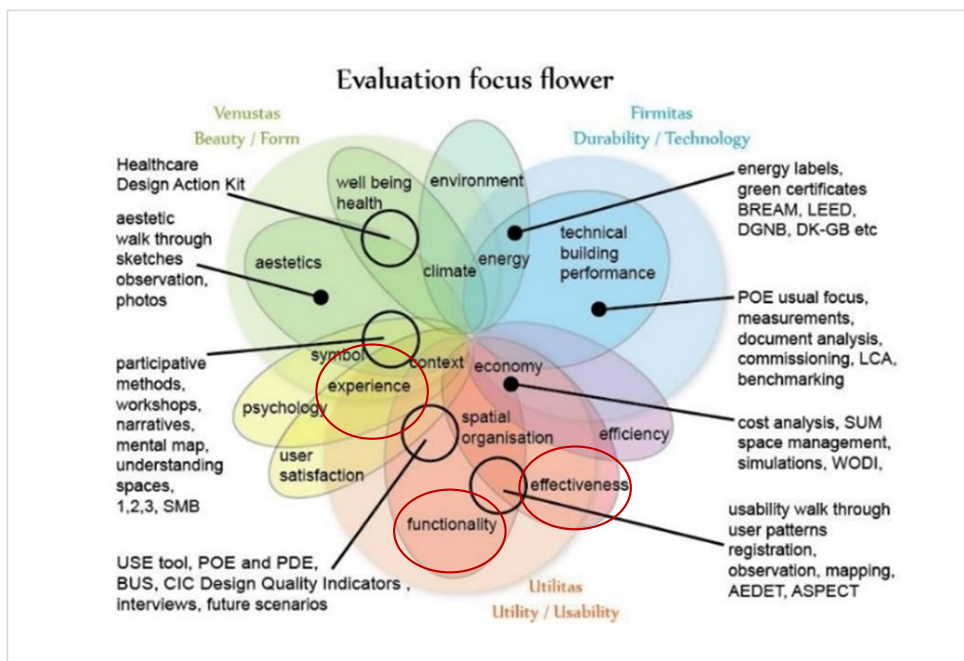


Figure 2-4: Evaluation focus flower model (Fronczek-Munter, 2016)

In this study, I focus on the evaluation of user experiences, building functionality, and spatial organisation (refer to the red circles in Figure 2-4). I will be describing the evaluation focus flower model in Section 2.3.2 – Part 2 of empirical data collection and Section 2.3.3 – Part 3 of empirical data collection.

2.2.2.2 Post occupancy evaluation in healthcare facilities

According to the existing knowledge on POE, over 150 techniques can be applied to the POE method. To collect credible data, I looked into the POE technique that can be implemented for the evaluation of hospital buildings. I applied three evaluation guidelines for this PhD study – Clinic Design for POE, building quality assessment method and measurement, and Rigshospitalet waiting areas evaluation guideline.

Clinic Design for POE – In 2011, The Center for Health Design (CHD) introduced a precise guideline for using POE to evaluate hospital buildings, called ‘Clinic Design for POE’ (The Center for Health Design, 2015); the guideline can be accessed at https://www.healthdesign.org/system/files/res_files/Clinic%20POE_process%20Guide_July%202015_0.pdf accessed on 09-05-2020). The Clinic Design for POE is a standardised toolkit providing guidelines for the evaluation of healthcare facilities. The CHD provides conceptual framework (Figure 2-5). The framework consists of four aspects: (1) organisation goals, (2) design intent, (3) environmental conditions and (4) outcomes. According to the CHD (2015), during the design process, the organisational goals are translated into a set of specific design principles and design features. The design decisions lead to a set of environmental conditions (e.g., lighting level, window views of nature) presented in the building after construction. The POE results will be used to confirm whether the design intent (features) are realised and to adjust organisational goals for future renovation or construction (The Center for Health Design, 2015).

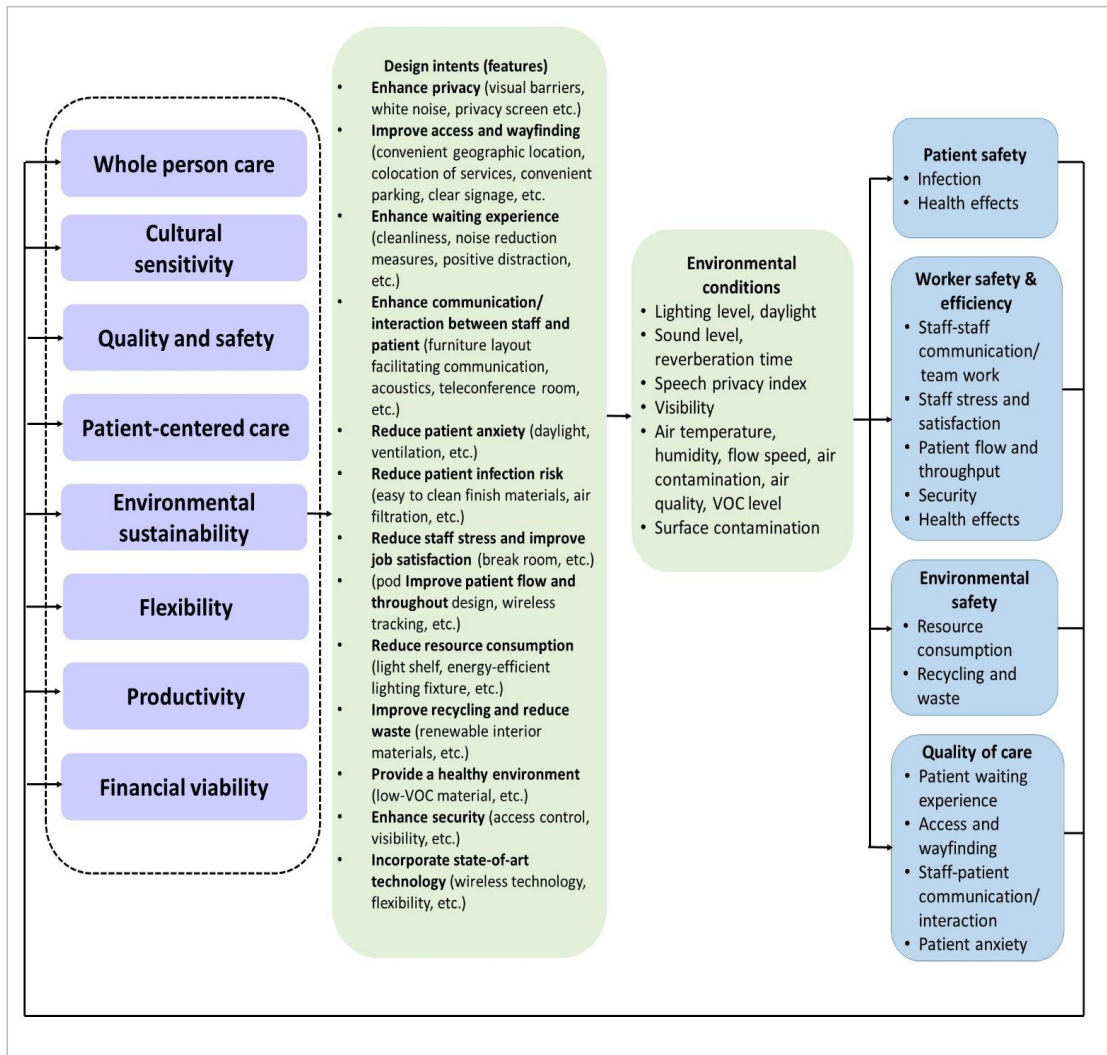


Figure 2-5: Conceptual framework of Clinic Design for POE
(The Center for Health Design, 2015)

This framework provided me the design intent with the overall criteria for evaluating the case studies. Moreover, the Clinic Design for POE also provided a precise data collection method called the 'toolkit' consisting five tools where I applied principle ideas from Tools 2, 3 and 4 for empirical data collection of hospital non-clinical areas. Details of the toolkit are as follows:

Tool 1 – General information, organisational goals and design principle

This tool aims to collect two types of information. The overall information about the organisation, the community health centre and the building project and contact information; and major factors that may impact building design, such as service types and number of physicians.

Tool 2 – Audit of physical environment

This tool can be used by interdisciplinary teams, including a representative of the community health centre, staff representative who is familiar with the facility design and operations and designers. The process of audit begins with a *walk-through* of various spaces (with paper and pen or a laptop), conducting observation, marking whether the design feature is implemented, and rating how well the design features meet certain criteria.

Tool 3 – Patient questionnaire

This step is to investigate patient experience by using questionnaires. Patients' (made anonymous) perceptions and experiences were gathered using the questionnaire.

Tool 4 – Staff questionnaire

A questionnaire facilitating anonymity is used to gather staff perception on environmental design and work experience.

Tool 5 – Outcome data collection

This form aims to facilitate data collection on outcomes related to the selected goals and design intent. The outcome focuses on clinic operation, but is not directly used for the physical environmental design, such as staff turnover rate, clinic cycle time, technical measurements (lighting and sound levels).

- Building assessment method and measurement** – Although the conceptual framework of Clinic Design for POE provided me with overall information of the design intent and features of healthcare facilities. The framework does not provide precise evaluation criteria for the functional quality of hospital non-clinical area. Therefore, I investigated the evaluation criteria that can be used to evaluate the functional quality of healthcare buildings called *building assessment method and measurement*. I applied the assessment method developed by Van der Voordt and Van Wegen (2005), where eight criteria can be implemented on the evaluation of hospital non-clinical areas. I complemented all these criteria listed by Van der Voordt et al. (2005) with the healing environment aspects developed by Huisman et al. (2012) to obtain specific insights. Table 2-1 illustrates the evaluation criteria that I used to evaluate the functional quality of the non-clinical areas of my main case studies (Maharaj Chaing Mai hospital and Rigshospitalet). To avoid repetition from Paper 1, table 2-1 only briefly illustrates the information.

Table 2-1: Evaluation aspect used in evaluating public hospital non-clinical areas

Aspect	Requirement
Reachability	Reachability by goods vehicles, private cars and public transportation
Accessibility	Minimum requirements for corridor width that will not restrict egress in the event of emergency evacuation (International Health Facilities, 2015)
Efficiency	Favourable location and suitable routes for people with ease of arrival and departure
Flexibility	Easily adjusted to suit changing circumstances, which means building should be easy to adapt without having to do much in the way of breaking down walls and without incurring high costs
Safety	User safety and patient safety ensured according to hospital accreditation standards
Spatial orientation	Clear distinction between public, semi-public and private spaces in this case, non-clinical areas (supporting facilities and services), clinical areas and patient bedroom
Privacy	Clear separation between clinical areas and non-clinical areas in every aspect
Health and physical well-being	Access to daylight and outside view, minimum noise level per accreditation standards

- Evaluation criteria of Rigshospitalet** – This is a specific evaluation guideline provided by the Rigshospitalet hospital planner team. The guideline is used specifically for the evaluation of waiting areas; it provides clear requirements that are easy to understand. An overview of guideline indicates specific requirements focusing on patient needs and their comfort as the hospital aims to increase the level of comfort in waiting areas. Besides the eight evaluation aspects from *building assessment method and measurement* (Van der Voordt & Van Wegen, 2005; Huisman et al., 2012), I also applied the evaluation criteria of Rigshospitalet for the evaluation of the non-clinical areas of my main case studies. Table 2-2 lists details of the evaluation criteria of Rigshospitalet's waiting areas.

Table 2-2: Rigshospitalet's waiting area evaluation criteria

Criteria	
1. Information support way-finding	4. Accessibility/Inclusion
<ul style="list-style-type: none"> • Wayfinding • Signage to toilet • Signage to water • Information boards • Displays 	<ul style="list-style-type: none"> • All patient profiles • Particular children areas • Railing support
2. Facilities	5. Building/Room/Architecture
<ul style="list-style-type: none"> • Drinking water fountain • Drinking water trolley • Coffee/tea • Refrigerated food • Display for magazines • TV • Information screen (TV) • Art • Sound/noise • Smell 	<ul style="list-style-type: none"> • Hard wall • Soft wall (gypsum boards) • Brick • Concrete • Glass/aluminium • Ceilings • Dampa panel system (33*33 cm/ 60*60 cm) • Light dampa 66*33 modules • Floors - linoleum • Doors - should any doors be removed?
3. Cleaning/Hygiene	6. Furniture
<ul style="list-style-type: none"> • Dishes • Waste containers • Dispensers for hand-gel 	<ul style="list-style-type: none"> • Sitting • Table • Reception

The combination of three evaluation guidelines create a precise non-clinical areas evaluation tool. I then employed a walk-through observation technique based on both the evaluation focus flower model (Fronczek-Munter, 2013) and Tool 2 from Clinic Design for POE (The Center for Health Design, 2015) to walk-through and collect data of non-clinical areas of the case study subjects.

2.2.2.3 Walk-through observation - This is one of the building evaluation techniques that can be applied to POE methods. Walk-through observation is part of the USEtool method (Blakstad et al., 2009,2010; Hansen, Blakstad, & Knudsen, 2011). The principal concept of the USEtool method is to evaluate building usability. Further details of usability will be provided in Section 2.3.3.1. The USEtool method is a combination of five steps (Figure 2-6), where Step 3 is walk-through observation. I also implement concepts from Steps 1, 2, 4 and 5 in my study; however, the steps are not consecutive as listed in the USEtool method model as I had chosen to apply multi-qualitative methods as a basis for my research methodology. Hansen et al. (2011) defines 'walk-through' as a tool carried out as an inspection tour of the building, with designated stops and with selected users, in order to gather their experiences in relation to the topic in question. In some cases, in-depth information is required. Therefore, it is necessary to conduct several walk-through observations, focusing on different topics that involve different stops and participants.

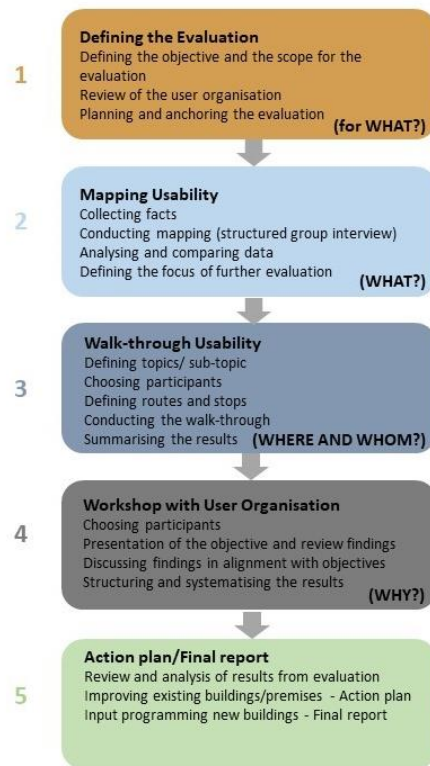


Figure 2-6: USEtool steps where I applied Step 3 (walk-through usability) for building evaluation technique (Hansen et al., 2011)

2.2.3 Other building analytical techniques employed in this PhD study

Besides the several tools that complimented the POE method, I also applied other building analytical techniques (Sections 3.2.3.1 and 3.2.3.2). However, due to the limited literature available on these techniques, I only applied them in Page1 and 2.

2.2.3.1 Analytical technique for design assessment - A simple term for analytical technique for design assessment is floor plan analysis. Architects, facility planners and project managers use the integration of POE and functional floor plan analysis to obtain insights and create optimised design guidelines (Van der Voordt et al., 1997). The tool used for floor plan analysis is called '*space syntax*' (Van der Zwart & Van der Voordt, 2015). The space syntax approach is a tool defining people pattern of and interaction within a building. The movements of people within a building's spatial arrangement create geometry and network typology of spatial patterns in the building's environment (Hillier & Hanson, 1984; Hillier & Lida, 2005). Space syntax contains several tools that can be used to analyse building spatial arrangement. In this study, I adopted two space syntax tools—functional floor plan analysis and spatial configuration analysis—to analyse the relationship between users and the building's spatial arrangement.

- **Functional floor plan analysis** - In this concept, the architectural floor plan is made visible by using colour codes. When applying functional floor plan analysis, important building elements, such as building fabric, structural system, the colour and finishes of furniture and installations, are usually omitted (Van Hoogdalem et al., 1985; Van der Voordt et al., 1997; Van der Zwart & Van der Voordt, 2015). Different colour schemes are applied in the architectural floor plan based on building functions such as building circulation, public space, semi-public space, private space and service areas. The colour codes provide clear spatial arrangement and space management for the building.
- **Spatial configuration analysis** – The relationship between users and specific spaces can be analysed through spatial configuration analysis. Van der Zwart (2014) describes this technique as one where a building evaluator uses lines/dots/circles to draw a relationship connecting people movement with building functions or rooms while they perform their role-defined tasks. For example, patients moving from the waiting area into the doctor's clinic. The lines create a map that illustrates the relationship between users and specific spaces/rooms. The lines/dots/circles reveal how many specific rooms are being used for what activity by whom and how often (Hillier & Hanson, 1984; Van der Zwart, 2014).

2.2.3.2 Reflexive photography, pictorial narrative mapping and semantic scheme

Reflexive photography and pictorial mapping are qualitative data collection and analytics techniques (Lapum et al., 2015; Maben et al., 2015). Maben et al. (2015) describes reflexive photography as a data collection method in which research participants take photographs and discuss and reflect on the image they took during an interview with a member of the research team. Reflexive photograph can also be used in hospital evaluation processes, Maben et al. (2015) applied the reflexive photography method requesting participants, who were clinical nurses, to take photos of the areas in their clinics (both clinical and non-clinical areas) that they think affect their work environment. Later, both participants and researcher have a 'reflexive' discussion that provides information of the physical environment through the eyes of the participants. Reflexive photography can generate a visual record of the spaces (clinics, nurse rooms etc.) and encourage the researcher and participants to critically analyse the physical environment. This technique is used to prompt a deeper consideration of the positive and negative aspects of the spaces (Maben et al., 2015). Pictorial narrative mapping is a technique that uses narratives to provide details or an explanation of the picture that express a specific phenomenon (Mamber, 2003). Creswell et al. (2018) explains the narrative approach as a tool for analysing the phenomenon that is being studied. In the health sciences, visual narrative mapping has been used as a qualitative technique to aid data analysis (Beck, 2006) in which temporal flow of study participants' narratives is highlighted (Lapum, 2009; Lapum et al., 2010). In this study, narrative pictorial mapping is used as an analysing method to express the details of hospital physical environment and physical condition in the photographs. The last technique that I applied was semantic scheme, which provide details of the aesthetic of space. The term semantics mean linguistic and philosophic study meaning of language. Therefore, in this PhD study I applied semantic scheme developed by Cold (2011) as analytical tool using words to express the aesthetic level of spaces as well their spatial planning (Cold, 2011).

2.2.4 Building evaluation and assessment applied in this study

The second literature framework provided me an overall idea of space management, building evaluation and the technique for empirical data collection and data analysis. Strategic space development provided me an overview of how hospital buildings could be developed. Studying the POE technique with the evaluation focus flower model provided me the tools for empirical data collection. For building function and building spatial organisation, I applied the USEtool step, walk-through, to observe and walk through several hospital non-clinical areas. To analyse the collected data, I applied three evaluation guidelines: Clinic Design for POE, building assessment method and measurement (eight criteria used to evaluate non-clinical areas) and Rigshospitalet waiting area evaluation guidelines. For data validity, I also implemented several tools for data analysis which include analytical techniques for design assessment, reflexive photography, pictorial narrative mapping and semantic scheme.

2.3 NEW PARADIGM IN HOSPITAL DESIGN

New paradigm in hospital design (Figure 2-7) involves the effect of the healthcare environment on a patient's clinical outcomes, and ideas and concepts regarding patient-focused approach. This section contributes to the development of the research questions in this study as well as data analysis. Therefore, in this section, I describe the new paradigm in hospital design including the evidence-based design (EBD) theory, healing environment theory, healthcare environment design and patient stress, and hospital waiting area. I then describe the psychology of waiting lines followed by a user-focused approach to the design process, transferring a user's need to optimise the design process. I end this section by describing how I have applied the new paradigm in hospital design in this study.

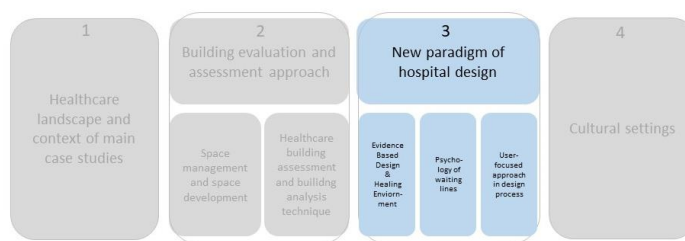


Figure 2-7: Third framework of literature background

2.3.1 Overview of new paradigm in hospital design

Interest regarding hospital design has been increasing owing to a paradigm shift in healthcare services, where patients are seen as end users (Ferguson, 2002). The term 'end users' was developed in the field of computer system design referring to a person who is the ultimate user or is intended to ultimately use a product (Shackel, 2009). Therefore, in the new hospital design approach, a patient is considered as a 'customer', where their needs and satisfaction are the backbone of healthcare services (Becker & Parsons, 2007). The built environment of a hospital plays an important role not only in patient satisfaction level but also has an impact on patient health outcomes (Ulrich, 1984; Ulrich, 2006). Research on hospital architecture and patient's clinical outcomes has been well established in the past three decades, where the concept of EBD and healing environment were introduced to healthcare designers, researchers and related professions.

2.3.1.1 Evidence-based design and healing environment

The term EBD refers to 'the deliberate attempt to base building decisions on the best available research evidence with the goal to improve outcomes and of continuing to monitor the success or failure of subsequent decision-making' (Malkin, 2008). In terms of hospital design, the EBD concept can be defined as 'the design process, which is guided by an empirical understanding of the effect of healthcare physical environments on safety, efficiency and clinical outcomes' (Hamilton & Watkins, 2009; Ulrich, 2006a; Ulrich et al., 2010). The development of the EBD concept started with a publication in a Science journal,

written by Roger S. Ulrich titled, 'A view through a window may influence recovery from surgery' (Ulrich, 1984).

Malkin (2008) described that in some respects, it can be said that the concept of healing environment has evolved into EBD, but it is mainly in the area of reduction of stress in patients and staff. Huisman et al. (2012) defined that EBD has become the theoretical concept of the healing environment. Therefore, the term healing environment refers to creating/designing a hospital physical environment that can reduce a patient's stress level and improve their clinical health outcome and well-being (Huisman et al., 2012; Ulrich et al., 2004). Well-being is a subjective term referring to a state of comfort, prosperity and happiness (Diener, 2009); in this study, it refers to a patient's comfort, happiness and satisfaction.

- Healthcare environment and patient stress** - As mentioned, the concept of EBD was established based on the knowledge that the physical environment can contribute to health and well-being (Becker et al., 2007; McCollough, 2010). Recent studies on healthcare physical environment support the existing knowledge about healing environment and the EBD concept. According to Harris, McBride, Ross and Curtis (2002), the physical can be described as the ambient environment (e.g. lighting, noise level and air quality), architectural features (e.g. layout of hospital, space planning and spatial arrangement), the size and shape of the rooms and placement of windows and interior design features (e.g. furniture and artwork). All the physical environment components are important for supporting care and helping patients return to health and well-being (An ker, Von Koch, Heylighen, & Elf, 2018). The concept of healthcare physical environment can also refer to all that surrounds the patient. Meleis (2017) states that there is constant interaction between the patient and the environment.

Several aspects of the physical environment that can contribute to a patient's health outcome have been examined. Huisman et al. (2012) and Ulrich et al. (2008) state that sound and light as well as the ability to experience nature can affect health and well-being. Becker and Douglass (2008) add that high levels of attractiveness, in the form of colourful contemporary furnishings and artwork, for example, may reduce a patient's anxiety. Janssen et al. (2014) and White et al. (2015) also state that the physical environment can also provide opportunities for activities and social interactions, for example, by providing access to communal areas with books, games and computers. Access to these opportunities for interaction can be an important prerequisite for recovery. Ulrich (1991) argues that to promote well-being, the physical environment should be designed to support patient care by providing a sense of control, access to social support and access to positive distraction. Ulrich et al. (2004, 2008) later present an example of hospital physical environment that can have a positive influence on patient/staff stress level, patient safety and patient pain level. Brief examples are as follows:

- **Reduce noise level** - Implement single-patient bedrooms with sound-absorbing ceilings.
- **Reduce staff fatigue** - Floor layout with decentralised nurse observation station, nurse charting station. Medical supplies located close to patient bedrooms. Access to outside view through windows, visual access to patients.
- **Reduce level of pain and depression** - Provide increased daylight exposure in patient's bedroom, create easy navigation for hospital building orientation, provide access to view of greenery or nature.
- **Increase patient safety and reduce infection** - Implement single-patient bedrooms, install air filtration, create cross ventilation, separate high-risk infected patient groups, install wash basins and hand-gel dispensers close to staff work paths, waiting areas and prominent locations.

The EBD concept has drawn increased attention; in the 1980s, a non-profit organisation from the USA called 'Planetree' was founded. The organisation developed the Planetree model, where the EBD concept was integrated (Planetree, 2020). The Planetree model emphasises patient-focused approach promoting mental, emotional, social and physical healing process by putting a patient at the centre of care services. In 2008, the organisation published a book called 'Putting patient first: Designing and practicing patient-centered care' (Planetree, 2020), which became key to the development of the EBD concept and patient-centred care approach throughout the world (Larsen, 2011; Fronczek-Munter, 2016). The Planetree model was also integrated with the design of Danish hospitals including Rigshospitalet, which indicates that Danish hospitals have been aware of patient needs and their well-being (PlanetreeDenmark, 2013).

EBD and healing environment, aiming to reduce patient stress levels, are the core components of the new paradigm of hospital design. Most recent research focus on the relationship between patient's stress and the healthcare environment. Connellan et al. (2013) presented 13 healthcare architectural themes that can contribute to positive mental health outcome in patients, where the outcomes can reduce patient stress. The 13 themes are: (1) security/privacy; (2) light; (3) therapeutic milieu; (4) gardens; (5) impact of architecture on mental health outcomes; (6) interior design; (7) psychogeriatric; (8) post-occupancy evaluation; (9) nursing stations; (10) model of care; (11) art; (12) designing for the adolescent and (13) forensic psychiatric facilities. The themes that Connellan et al. (2013) presented align with the existing knowledge regarding EBD and healing environment.

- **Hospital waiting area** - Despite the fact that many studies have presented the impact of the healthcare environment on patient health outcomes, not many studies emphasise the relationship between waiting area design/architectural component and patient well-being. *Lack of research on how the design of non-clinical areas (waiting area) can contribute to patient health outcomes resulted in a knowledge gap in my study.* Jiang Powers, Allison, and Vincent (2017) and Pati and Nanda (2011) claim that hospital non-clinical areas, which includes public spaces, waiting areas and supporting facilities, play an important role in a patient's health and well-being.

Fogarty and Cronin (2008) also add that most medical processes involve 'waiting' - from the moment that a patient begins their care journey with diagnosis of the health issue to receiving health outcome. Jiang et al. (2017) also state that the waiting area is commonplace among people seeking healthcare, and has become a topical issue in the research and design of healthcare environment. Waiting can be frustrating and time consuming, especially in a hospital (Jiang et al., 2017; Pati & Nanda, 2011). Hospital waiting experience can be filled with anxiety and stress due to patient health conditions and lack of useful information (Fogarty & Cronin, 2008). Depressing surroundings in hospital waiting areas can also hinder relaxation for patients (Jiang et al., 2017). Andrade, Devlin, Periena, and Lima (2017) state that the healthcare environment has a direct link to both objective and subjective indicators of patient stress level, where both clinical and non-clinical areas might play equal roles in a patient's well-being. The enhancement of the environment in waiting areas can improve the mood (Andrade et al., 2017), alter physiological state (Leather, Beale, Santos, Watt, & Lee, 2003) or even lower reported anxiety of patients before and after consulting with a doctor (Rice, Ingram, & Mizan, 2008). Recent studies on waiting areas and patient perception indicated that the physical environment of the waiting areas can have an impact on patient anxiety, stress, perception of quality of care and their perception of waiting time (Arneill & Devlin, 2002; Becker & Douglass, 2008; Thompson et al., 1996).

2.3.2 Psychology of waiting lines

Due to the lack of research on the impact of the design of waiting areas on patient health outcome and well-being, I looked into service management and design operation, where the study focuses on the perception of a customer's waiting times (Jones & Peppiatt, 1996).

In most service businesses, designing and operating a business that can minimise a customer's waiting time is a primary goal. Maister (1985) states that a customer's perception of waiting time is different from reality. Maister (1985) then developed the idea of how customers perceive their waiting time called 'the psychology of waiting line', which consists of eight propositions. However, the idea was fully conceptualised. Therefore, Jones and Peppiatt (1996) revised 'the psychology of waiting line' proposition into a more practical concept, which matches individual customers as well as those who come in groups. The ideas are as follows:

- **Propositions affecting all users:**
 - the more valued the service, the longer people will wait
 - solo waiting feels longer than group waiting
 - unoccupied time feels longer than occupied time
 - unfair waiting feels longer than equitable waiting
 - uncomfortable waiting feels longer than comfortable waiting
 - new or infrequent users feel they wait longer than frequent users
- **Propositions affecting frequent users:**
 - unexplained delays seem longer than explained delays

- **Proposition affecting infrequent users:**
 - anxiety makes waiting feel longer
 - uncertain waiting seems longer than certain waiting
 - unexplained waiting seems longer than explained waiting
 - pre-process waiting feels longer than in-process waiting

Davis and Heineke (1993) and Jones et al. (1996) suggest that tolerance to queuing varies widely from one cultural group to another. The cultural difference plays an important role; reports on the opening of Disneyland Paris state that nationals from different countries behaved very differently when faced with queues for rides - some waiting patiently in line, others accessing rides through exits to completely avoid queues.

The 'psychology of waiting in line' proposition suggests that customers should not be view as a homogeneous group. Significant differences exist between frequent, repeat customers and infrequent or first-time customers, as different groups of users have different perceptions and requirements (Jones et al, 1996). This proposition supports the EBD concept, where the user is key to creating an efficient service. Therefore, user focus and user involvement concepts will be discussed in the next section.

2.3.3 User-focused approach in design process

The concept of user-focused approach in design process and EBD are interconnected. Bate and Robert (2006) state that EBD is a user-focused design process with the goal of making the user experience accessible to designers, allowing them to conceive of designing experiences rather than designing services. Therefore, the user-focused design approach is the design process, where a user's needs are at the forefront of the design process in order to optimise the design outcome (Fronczek-Munter, 2016; Nielsen, 2013; Rubin, 1984). Good design is a combination of three elements: (1) functionality, (2) safety and (3) usability (Bate et al., 2006). The concept of user-focused design stemmed from the field of product design and software development. The term user-focused design approach can also refer to the concept of 'user-centred design' where, the goal of user-centred design is to pay extensive attention to usability goals, user characteristic, environment, tasks and workflow of a product, service or process at each stage of the design process (Fronczek-Munter, 2016; Rubin, 1984; Henry & Thorp, 2004). The user-centred design is at the centre of two circles. The inner circle includes the context of the product, objectives of developing it and the environment it would run it. The outer circle involves more granular details of task detail, task organisation and task flow. According to Rubin (1984), the main objective of a user-focused and user-centred approach is to achieve a high degree of usability.

2.3.3.1 Usability and user-focused approach in design process

According to the International Organisation for Standardisation, the concept of *usability* refers to 'the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specific context of the user' (ISO 9241-11, 1998; ISO 9241-210, 2010). During the past 20 years, there have been studies on new developments in usability and user-focused approaches in the field of architecture, design and facilities management.

Usability has been a pillar of the architecture and design field for centuries. Fronczek-Munter (2013, 2016) states that the Roman architect, Vitruvius (80-15 BC), introduced three design principles that can lead to an optimal design outcome. The three principles are *firmitas* (durability/technology), *utilitas* (utilities/usability) and *venustas* (beauty/form). Fronczek-Munter (2013) developed the evaluation focused flower model based on the three design principles, which I applied for data collection while building the evaluation step. In the 70s, a British-American architect, Christopher Alexander, wrote a series of books, one of which called 'A pattern language' provides theories about human-centred design guidelines. The book started with applying a user-focused design approach in urban planning, large public buildings (healthcare centres, universities, offices) and small private buildings (a house or apartment) (Alexander et al., 1977). The theories from the book emphasise that in every scale of building design (from urban planning to household design) a user's needs should be at the centre of attention to create a high degree of usability (Alexander et al., 1977). However, Van der Voordt and Van Wegen (2005) translated the term usability into a more practical term called 'functional quality', which was widely used among architects and designers. The term functional quality refers to a 'building that has the ability to fulfil the functions it is envisaged for' (Van der Voordt et al., 2005). Nonetheless, functional quality is a subset of a larger term 'architectural quality'. Hiller, Leaman, Stansall, and Bedford (1976) and Van der Voordt et al. (2005) explain the concept of architectural quality as an integration of four core components: (1) functional quality, (2) aesthetic quality, (3) technical quality and (4) economic quality.

In the field of facilities management, the term usability had been introduced through space management studies at workplaces (Alexander, 2005, 2010). Blakstad et al. (2010) defined usability in built environment as 'buildings that not only support and shelter its users but also provide efficiency and effectiveness that contribute to positive satisfaction to its users'. As the concept evolved, the context of building users was added to it. Alexander (2008, 2010) identified additional key concepts of usability as 'context, culture, situation and user experience that can strengthen the efforts to understand and improve usability in the building environment'. Based on its development, the new concept of usability has split from the concept of 'functionality'. Jensen (2010) supported the distinction of the two terms, where usability integrated a subjective view of the users in the design process, while functionality only focused on objective measurable factors in the design process.

- **User focus and user involvement in the design process** - One way to create a high degree of usability is through user involvement (Alexander, 2010). In a typical design process, user-focused approach and user involvement can be implemented during the design brief and evaluation processes (Binder & Brandt, 2008; Stovang et al., 2014). Several methods can be employed for user involvement during the design process, some of which intertwine with POE data collection tools (Stovang et al., 2014). Fronczek-Munter (2016) presents tools and techniques that can be used for user focus and user involvement during the design process, some of which have already been listed in the evaluation focus flower model (Section 2.2.2.1). Table 2-3 illustrates the user-involvement techniques that can be used to obtain information from users (information for design brief) and also to develop the design with users (develop design brief and building evaluation).

Table 2-3: Key tools for user involvement in the built environment design process (Fronczek-Munter, 2016)

Obtain information from users	Develop the design with users
<ul style="list-style-type: none"> • Benchmarking • Desk research • Flow analysis • Focus groups • Functional analysis • Interviews • Market analysis • Observations • Occupancy study • Persona • Photographs • Registering, recording of data • Statistics • Surveys • Video recording 	<ul style="list-style-type: none"> • Brainstorming • Design games • Design lab • Dialogue • Drawing • Idea development and co-creation • Lead user • Mock-up • Model tests • Narratives, storytelling • Observations • Picture, diagram, associations, cards • Prioritizing • Rapid prototyping • Scenarios • Simulation • User meetings • Video recordings and discussions • Virtual reality • Walk-through evaluation (USEtool, POE) and discussions • Workshops

In conclusion, I find that a user-focused approach is the core component of the user-centred design concept. However, the two terms are intertwined. Usability is the main focus of user-centred design (user-focused approach), the term usability refers to a 'product that can be used by specific users to achieve specified goals'.

Nonetheless, the term usability was first developed in the 1950s in the field of Human Computer Interaction. Usability is later widely known in relation to applications within User Centred Design, Usability Engineering and user experience, where the term is associated with friendliness criteria (Hansen et al., 2011; Aalto, Lappalainen, Salonen, & Reijula, 2017). Usability in built environment and facilities management was later applied in 2000s through built environment and facilities management research group called the International Council for Research and Innovation in Building and Construction (CIB) (Alexander, 2005; Alexander, 2010). After the usability in built environments has been introduced, the term has been widely applied throughout the field of facilities management, architectural and engineering due to its rigorous meaning.

'Usability' in built environment refers to a building that (1) supports and shelters users while they are performing activities; (2) contributes to efficiency, effectiveness and satisfaction; and (3) is influenced by users (culture, situation and experiences) and the environmental context. User involvement is a technique for achieving a high degree of usability where many tools, including POE (table 2-3), can be employed to ensure user involvement during the design process.

- **Patient-focused approach integrated in hospital service and patient journey** - User-focused design in hospital non-clinical areas is the crux of my study, and these areas are part of hospital services. Therefore, I also looked into service design and facilities management service blueprint, where the theory focuses on customer involvement in improving the design of business services. Service blueprint is an analytic method from the field of service design aiming to optimise service processes (Shostack, 1982). Coenen, von Felten, and Schmid (2011) applied this method to facilities management (FM) in the healthcare sector, where an FM service blueprint represents medical and non-medical processes in healthcare facilities (intake, waiting to see the doctor, receiving treatments, hospitalisation and discharge). In order to deliver and validate effectiveness and efficiency of healthcare services, a patient's behaviour, perception and experiences should be considered and integrated into the services design to enable the effectiveness of primary activities (Coenen, von Felten, & Schmid, 2011; Von Felten, Coenen, & Pfenninger, 2012). User-centred service design is an approach that can identify problems for improving pathway design and new services delivery (Simonse, Albayrak, & Starre, 2019). Healthcare service is best observed through close and direct personal interaction with patients (Layton et al., 1998; Simonse et al., 2019). Bate and Robert (2006) state that the idea of co-designing service could be a key to the success of healthcare services. Co-design service is a concept where patients and healthcare staff play a key role in leading service design partnering with hospital planners and facilities managers. Bate et al. (2006) also added that a patient's perception and experience is first-hand knowledge that can be useful in developing an effective service design.

A customer's journey is the practical aspect of the FM service blueprint representing each stage that a customer goes through while experiencing a product or service (Nenonen et al., 2008; Stickdorn & Sneider, 2012; Van Boeijen et al., 2014; Kimbell, 2014). In healthcare service, a customer's journey can be described as 'patient care journey (or patient care pathway)'. Simonse et al. (2019) described a patient's journey as a comprehensive representation of a healthcare service and its procedures, including interactions with and perceptions of patients. Bate et al. (2006) indicate that the best way to improve patient-care journey is to integrate a patient's experience into the service design. One of the advantages of investigating a patient's journey is the opportunity to examine a patient's entire experience rather than just parts of it, with emphasis on the fact that patients must remain at the centre of any analysis (Richardson, Casey, & Hider, 2017).

2.3.3.2 Transferring user need to optimise design process

To be able to transfer information or communicate with multiple groups of users, the right technique should be employed. I have implemented two techniques to transfer information and communicate with multiple groups of users (patient and healthcare staff). First, I applied persona as a tool to transfer the information I obtained from one user group to another. Second, I applied boundary objects and communication techniques to users (healthcare medical staff).

- Persona** – The term persona refers to someone's character as perceived by others. In the discipline of user-focused design approach, personas are fictional people or characters that imitate a real person. Grudin and Pruitt (2002) state that personas are fictional characters and that they have names, likenesses, clothes, occupations, families, friends, pets, possessions, life stories, goals and tasks. Many leading organisations and government agencies have adopted this idea as a formal tool for user-focused and user experience design (Kaplan & Wolfe, 2015). The idea began as a loose method for user-centred design/user-focused approach and later developed into a more structured technique. Matthews, Tejinder, and Whittaker (2012) add this is a critical method for orienting design and development teams to user experience. Personas is also useful when information from users is constrained - too limited or too broad, for example, large development teams with information on a diverse group of users, where the participatory design method is excluded (Matthews et al., 2012). Personas can engage several stakeholders involved in the design process and inform them about users, leading to efficient design decisions without inappropriate generalisation (Matthews et al., 2012; Cooper, 1999; Goodwin et al., 2009; Pruitt et al., 2003, 2006). Therefore, the personas method is a well-structured communication tool for user-focused design processes that involve several groups of stakeholders. Nielsen (2013) lists two major benefits of personas which align with my research interests. First, personas foster the design centre as it provides straightforward information about users to the service provider. It puts the end users at the forefront by providing the key information of the end user and their characteristics in a succinct package. Second, personas is a valuable communication tool. This includes communication between internal team members from different disciplines on the same project (marketing, visual design, domain specialists, architects), communication across projects within an organisation (meeting the needs of the same audience) and communication with (and between) external agencies (Kaplan et al., 2013; Nielsen, 2013). In a project for a case management system in a large public sector organisation, this method was used to help the management and project teams understand the impact of the solution on end users (Kaplan et al., 2013; Nielsen, 2013). In each project, the team members preferred referring to the user as 'Pascal' rather than User Group 1, and discussions centred on Pascal's experience and interactions with other personas (Melvin, Tessa, Kevin and so on). Kaplan et al. (2013) and Nielsen, Storgaard, Jan and Jane (2015) describe the process of personas as team member discussed *user journey*, where sticky notes were used for each persona to reflect the impact on each of them. In the end, Pascal was covered in sticky notes that visually demonstrated the complex and onerous nature of the business process.

- **Boundary objects as a tool and method in user-involvement sessions** - The concept of boundary objects is described as problem solving by means of translation (Star & Griesemer, 1989). On the contrary, the concept of boundary objects can also refer to a communication tool between communities (Fronczek-Munter, 2012). Clarke and Fujumura (1992) define boundary objects as artefacts, things, tools, techniques in addition to ideas, stories and memories of community members. 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 (Brown & Duguid, 1991; Wenger, 2000; Broberg et al., 2011). They can be abstract or concrete objects that arise over time from durable cooperation and are understood or misunderstood in equality among the participants.

In terms of the briefing and design process, boundary objects are divided into five categories (Carlie, 2002, 2004; Wenger, 2000; Broberg et al., 2011; Fronczek-Munter, 2012):

- **Repositories** - sources of database, libraries
- **Standardised forms and methods** - drawings, handmade sketches, lists of problems, questionnaires
- **Objects, models and maps** - slideshows, architectural drawings, and 3D renderings, fishbone charts, diagram charts, mock-ups
- **Discourse** - meetings, questioning situations, typical action situations
- **Processing** - visiting other teams in the organisation, visiting other organisations, prototyping or testing prototypes

Four characteristics that help analyse boundary objects in terms of briefing and design processes are (Fronczek-Munter, 2012; Broberg et al., 2011):

- **Boundary objects are not ready-made** but are *objects-in-the-making*, and 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 objects**, develops rules and instructions and guides the workshops
- **Boundary objects are used in discrete events**, workshops with a *temporary learning space*, and enable a collaborative design process into 'design mode'

Fox (2011) describes boundary objects in the social context since they may either be facilitative or inhibitive of cross-boundary communications and innovations. The use of boundary objects depends on the objective of the group of users. Fox (2011) adds that the range of possible use of boundary objects is narrow, limited to abstracts or representations of other objects constructed within communities of knowledge or practice. Moreover, the boundary objects concept is still under-theorised; little has been written on how it works and what role human agencies plays in its function. To conclude, boundary objects can be used as a facilitator for cross disciplinary communication; however, the concept is still abstract with limited theorisation.

2.3.4 New paradigm of hospital design applied in this study

The third literature framework provided me with an overview of and insight into the paradigm shift in hospital design, the psychology of waiting lines and the user-focused approach in the design process. A majority of the information obtained from this section of the literature review helped me with data analysis and a part of it facilitated data collection (communicating with and transferring information to multiple groups of participants). I integrated the EBD and healing environment theories with the literature review of hospital waiting areas while analysing data collected during building evaluation and the walk-through observation of my case studies. Moreover, the theory of healthcare environment and patient stress provided me insights into data analysis while coding patient interview transcripts.

The psychology of waiting lines provided me with insights and key components that can improve a patient's experience while waiting for medical services - I applied this concept for patient and medical staff interview analysis. The user-focused approach in the design process helped me set up the last part of my empirical data collection as well as data analysis. I applied the user-focused/user-involvement concept to set up patient and medical staff interview questions, where some interview questions involve patient and medical staff involvement in and perception of hospital design involvement. The theory of user-involvement in the design process also provided me insights for data analysis. A literature review of the patient-focused approach integrated into hospital service and patient journey helped me structure my methodology. The theory helped me justify that interviews with patients and medical staff are necessary because they are the end-users of hospital waiting areas and they can give me valuable first-hand data.

Lastly, the literature review of personas and boundary objects provided me with an understanding of different tools and objects used during meetings between different participant groups - medical staff, hospital planners and researchers. My criteria for analysing and evaluating results using personas and boundary objects are as follows: How well do medical staff, hospital planners and researchers communicate during meetings? How easily can personas be applied for communication between two different professions (designers and medical staff)? Did any new idea emerge during the meetings through the use of personas? To conclude, the third literature framework is a key component of the data analysis for this study.

2.4 CULTURAL SETTINGS

Cultural settings (Figure 2-8) was the primary tool for the analysis of my main case studies, that is, Maharaj Chiang Mai hospital, Thailand and Rigshospitalet, Denmark. Therefore, in this section, I describe the five dimensions of national culture which provide me an overview of cultural dimensions and how cultural settings influence user perceptions (patients and medical staff). I conclude by describing how I have applied the theory of cultural dimension in this study.



Figure 2-8: Fourth framework of literature background

2.4.1 Six dimensions of national culture

A dimension of social structure and social norms is that norms shape the behaviour of individuals in a social system (Geertz, 1973). Each social system is also governed by culture, which consists of several layers that build on top of each other but are also intertwined (Van der Voordt & Van Meel, 2016; Schein, 2004). The context of culture is certainly different in each country and has an influence on social norms and individual behaviour (Vom Brocke & Sinni, 2011; Van der Voordt et al., 2016; Riratanaphong, 2014). Hofstede (1997) states that culture is a catchword for not only all those patterns of thinking, feeling and acting that refine the mind, but also for the ordinary things in life such as greeting, eating, showing or not showing feelings, personal space and so on. The study of the influence of culture on individual behaviour identifies three fundamental issues: (1) relation to authority, (2) conception of self - the relation between individual and society; the individual concept of masculinity and femininity and (3) ways of dealing with conflicts, including the control of aggression and the expression of feeling.

Hofstede (1997) investigated the cultural differences of IBM employees in 50 countries around the world. The differences in value among matched populations of employees of national subsidiaries of a multinational allow a conservative estimate of differences among national populations at large, as respondents are thought to share the same worldwide corporate culture (Riratanaphong, 2014). Six cultural dimensions were identified (Riratanaphong, 2014; Hofstede, 2011):

- **Power of distance** – The power of distance is the extent to which less powerful members of institutions and organisations expect and accept that power is distributed unequally.

- **Individualism** - The term stands for a society in which the ties between individuals are loose; a person is expected to look after himself or herself and his or her immediate family only. Collectivism stands for a society in which people from birth onwards are integrated into strong, cohesive in-groups, which continue to protect them throughout their lifetimes in exchange for unquestioning loyalty.
- **Masculinity** - The term stands for a society in which emotional gender roles are clearly distinct; men are supposed to be assertive, tough and focused on material success while women are supposed to be more modest, tender and concerned with the quality of life. Countries with a high masculinity ranking indicate that the society will be driven by competition, achievement and success, with success being defined by the winner or whoever is best in the field. Countries with a high femininity ranking indicate that the dominant values in the society are caring for others and quality of life.
- **Uncertainty avoidance** – This is the extent to which a member of institutions or organisations within a society feels threatened by uncertain, unknown, ambiguous or unstructured situations.
- **Long-term orientation** - This is closely related to the teaching of Confucius, whose principles were founded in common Chinese tradition and beliefs. This orientation can be interpreted as dealing with a society's search for virtue, the extent to which a society shows a *pragmatic future-oriented perspective*, in particular perseverance and thrift, rather than a conventional *historical short-term point of view*. Short-term orientations stand for a society that fosters virtues related to the past and present, particularly respect for tradition, preservation of 'face' and fulfilling social obligations.
- **Indulgence** - The term stands for a society that allows relatively free gratification of basic and natural human desires related to enjoying life and having fun. Restraint stands for a society that controls gratification of needs and regulates it by means of strict social norms.

In each dimension, differences between countries manifest themselves at different levels: hospitals - patients/medical staff, workplace - citizen/state, ethics/philosophy.

2.4.2 Cultural difference between Thailand and Denmark

This section focuses on the difference between Thai and Danish cultural dimension. To have an overview of both countries cultural setting, I will, first, described Thai and Danish national characteristics. Later I compared Thai and Danish cultural setting based on Hofstede's six cultural dimension theory (Hofstede, 2011). Although the comparison only concerns the primary case studies - Thailand and Denmark - the information can also represent South East Asian and Scandinavian cultures, which includes the secondary case studies from Singapore and Norway.

2.4.2.1 Thai national characteristic as the concept of Thainess

One of the most important aspects that plays major role in Thai cultural value is religion. Buddhism is Thai national religion as 96.4% of Thai population are Buddhists (Thai National Statistic Office, 2015). The term 'Thainess' established during the reign of King Rama VI

(reign 1881-1925), the term was developed under strong influences of Western civilization. The term 'Thainess' emphasizes that Thai value comply with Western value; however, Thainess is still predominated by Buddhism as the religion influences Thai people in term of rational dogma as well as seeing themselves as Buddha's lineage (Riratanaphong, 2014). Therefore, Thai national characteristic can be described based on the term of Thainess, where Buddhism influences the country's core values. In this way, no matter how much the society develops, the Thai way of life will still remain, because the society has been rooted in kindness, generosity and harmony under the unifying spiritual centre of Buddhism (Sattayanurak, 2005; Riratanaphong, 2014).

2.4.2.2 Danish national characteristic

According to Østegård (2012) the Danish national characteristic is described as first, strong national feeling people. Second, self-assured as the Danes love freedom and equality. For example, the Danes do not like working with commands but rather prefer working towards a factual argument. Third, the Danes are hard-working and serious. Østegård (2012) mentions that Danes are industrious, which is aligned with Northern and Western European values (Hofstede, 2011). Fourth, the Danes love cozy home life, the Danish word 'hygge' refers to a mood of coziness and comfortable conviviality with feelings of wellness and contentment (Linnet, 2010). Nonetheless, hygge can also refer to 'a form of everyday togetherness' and the term is shown to be a pleasant and highly valued everyday experience of safety, equality, personal wholeness and a spontaneous social flow (Linnet, 2010).

To summarize, Danish people seem to value freedom and equality, commitment, power of sharing and participation. This argument is aligned with various studies concerning Danish national characteristic and cultural value (Hofstede, 1980; Heller & Wilpert, 1981; Zemke, 1988; Douglas & Douglas, 1989; Grenness, 2003).

2.4.2.3 Comparison between Thai and Danish culture on six dimensions of national culture

This section presents a comparison of six cultural dimension between Thailand and Denmark (Hofstede, 2011). Later, I provide explanation comparing each cultural dimension between the two countries. Figure 2-9 presents simple columns chart comparison cultural index score between Thailand and Denmark (Hofstede, 2011), the chart is available at: <https://www.hofstede-insights.com/country-comparison/denmark,thailand/>.

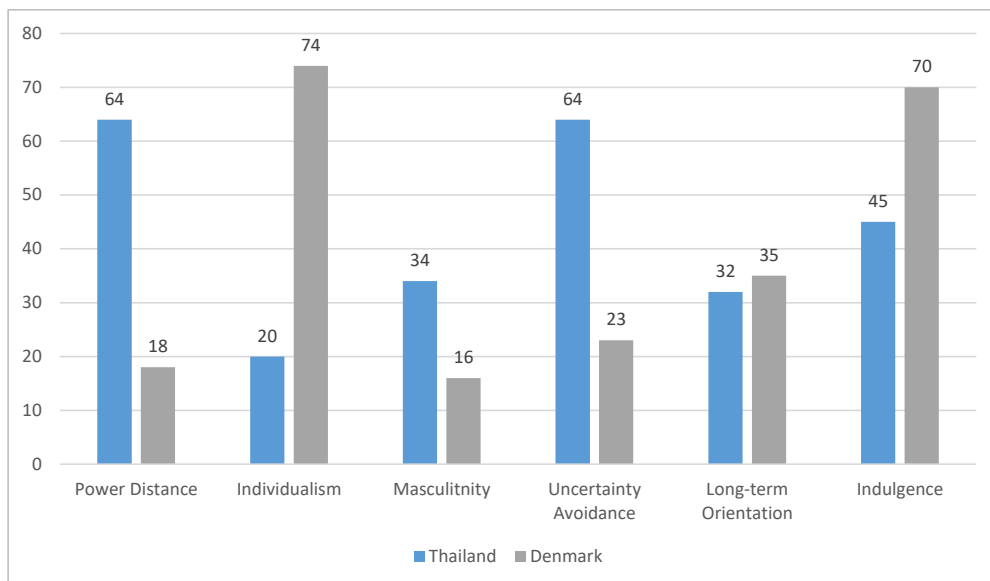


Figure 2-9 : Comparing Thailand and Denmark cultural dimension based on cultural index score (Hofstede et al., 2010)

- Power distance** - Thailand has a high score of power distance (64). This indicates that Thailand is a high power distance society. Hofstede (1997) described power distance as the degree of centralisation of authority and the degree of autocratic leadership. A power distance society, including Thailand, accepts inequality. On the contrary, Denmark has relatively low score on power distance (18) aspect. This is aligned with Danish national characteristics, where the Danes value freedom and equality. Danes do not lead and it is important that self-autonomous is required as they believe in independency and equal rights. Respect among the Danes is something everyone earns by proving his/her hands-on expertise (Hofstede et al., 2010).
- Individualism** - Thailand has low score of individualism (20) which means Thailand is a highly collectivist country (Brown, 1995; Hofstede, 2011). In collective societies, people are integrated into strong cohesive in-groups that protect them in exchange for unquestioning loyalty. This is also manifest in a close long-term commitment to the member 'group' (a family, extended family, or extended relationship) (Riratanaphong, 2014). Opposite to Thailand, Denmark has high score of individualism (74). Therefore, like many other Western countries Denmark is seen as an independent society (Hofstede, 2011). People in individualist societies are supposed to look after themselves and their family only, whereas people in collectivist society belong to 'in-group' that take care of them in exchange for loyalty (Hofstede, 2001; Riratanaphong, 2014). This is also aligned with Danish cultural value where Danes value people for their work and contribution to society as individuals.
- Masculinity** - Both Thailand (34) and Denmark (16) have low score on masculinity. This indicates that both countries are feminine society, where quality of life is a sign of success and standing out from the crowd is not admirable. On the contrary,

masculine society value competition, achievement and success where success being defined as winner. Hofstede et al., (2010) also added that the fundamental issue of this dimension is what motivate people, wanting to be the best (Masculine) or liking what you do (Feminine).

- **Uncertainty avoidance** - this dimension has to do with the way a society confronts an uncertain future: should the future be controlled, or should it just happened? (Riratanaphong, 2014). Thailand has a high score (64) of uncertainty avoidance, which means that Thais tend to avoid uncertainty situation: change is not acceptable in the society. Strict rules, policies, regulation, and bureaucracy can be implied to minimise high level of uncertainty. On the contrary, Denmark has a low score (23) of uncertainty dimension. This means that Danes do not need a lot of structure and predictability in their life or work. Hofstede (2011) added that curiosity is natural and is encouraged from young age. This combination of highly individualist and curious nation is also the driving force for Denmark's reputation within innovation and design.
- **Long-term orientation** - Thailand and Denmark have similar scores on long-term orientation, which means that Thailand and Denmark are short-term orientation societies. Hofstede et al., (2010) described that short-term orientation society is normative society, which refers to less thrift efforts to prepare for the future. Moreover, short-term orientation society concerns the idea of 'doing what is normally done or what most others are expected to do in practice.
- **Indulgence** - this dimension can be defined as the extent to which people try to control their desires and impulse (Hofstede et al, 2010). Thailand has intermediate score (45), so a preference in this dimension cannot be defined for Thailand. However, Denmark scores high in this dimension (70) and based on Hofstede theory Denmark is an indulgent country. People in Indulgence society generally exhibit a willingness to realise their impulses and desires with regard to enjoying life and having fun. In addition, they place a higher degree of importance on leisure time, act as they please and spend money as they wish (Hofstede, 2011).

2.4.3 Cultural settings and the six cultural dimensions applied in this study

A literature review of cultural settings as my fourth framework provided me an overall idea of cultural settings and the concrete components of cultural settings based on the six cultural dimension theory (Hofstede, 2011). The literature review also helped me with understanding how cultural influences a user's perception and opinion (patients and medical staff).

Although there are not many studies focusing on the impact of cultural dimension towards healthcare users' experiences, some studies are aiming to emphasize the influence of cultural setting on the development of user centred design through user involvement approach. Most of the studies applied Hofstede cultural dimension theory (Oyugi et al., 2008; Riratanaphong, 2014; Teka et al., 2017), where the studies suggested that four cultural dimensions can have influence on user involvement and user centred design, which

includes Power distance, Individualism, Masculinity/femininity and Uncertainty avoidance. I, therefore, applied these dimensions during analysis of the interview transcripts, where I thoroughly focused on user involvement and user experiences toward hospital waiting areas. The details of key dimensions that I applied for this study analysis are as follows.

First, concerning Power distance it is clear that Thailand is a hierarchical society, where inequality is accepted and subordinates are told what to do, whereas Denmark values the equality among people. Therefore, commanding people what to do does not work in Danish society.

Second, concerning Individualism Thailand is considered a collective society, where strong cohesive in-group plays important role in everyday life aspects. Moreover, Individualism and Power distance are interconnected with 'face' culture. Thai is a non-confrontational society (Jirachiefpattana, 1996; Riratanaphong, 2014). Therefore, helping each other out and avoiding conflict and criticism is necessary for Thai social interaction based strongly on 'face-saving' aspect (Mulder, 2000; Thanasakit and Corbitt, 2002; Deveney, 2005; Hofstede et al., 2010). On the other hand, Denmark is clearly an individualistic society. The affirmation of individuals can be strongly seen in many aspects of Danish everyday life. Therefore, Danes value people for their work they do and their contribution to society.

Third, concerning Masculinity both countries are Feministic society as the society values individual quality of life over achievement and success. Therefore, everyday life atmosphere of both societies is relaxed with limited competitive and society pressure. Oyugi et al., (2008) added that this cultural dimension can also represent prioritization of gender role in society. For example, high masculinity society such as China prioritizes the role of male over female in most of everyday life activities.

Fourth, concerning Uncertainty avoidance Thai is leaning toward Uncertainty avoidance society, which indicates that things are difficult to change in all aspects of life. On the contrary, change and new idea are highly acceptable among Danes. Moreover, rule and bureaucratic process is often kept at a minimum in Danish society.

One of the key concepts in this PhD study is to understand users' experiences towards public hospital waiting areas as well as how to implement user-centred design approach in the design of hospital waiting areas. Therefore, understanding culture of users and cultural characteristics is required for the development of user centred design and user involvement approach.

2.5 SUMMARY OF LITERATURE REVIEW APPLIED IN THIS STUDY

In this section, I summarize and develop an overall framework of theories employed in this study. Figure 2-10 shows a model of overall theories applied in this study. Circle size indicates how much each theory contributes to the development of this PhD study. The summary model of theoretical background helped me with better visualizing my core findings. More details of how I applied each theory into this PhD study is provided in table 2-4.

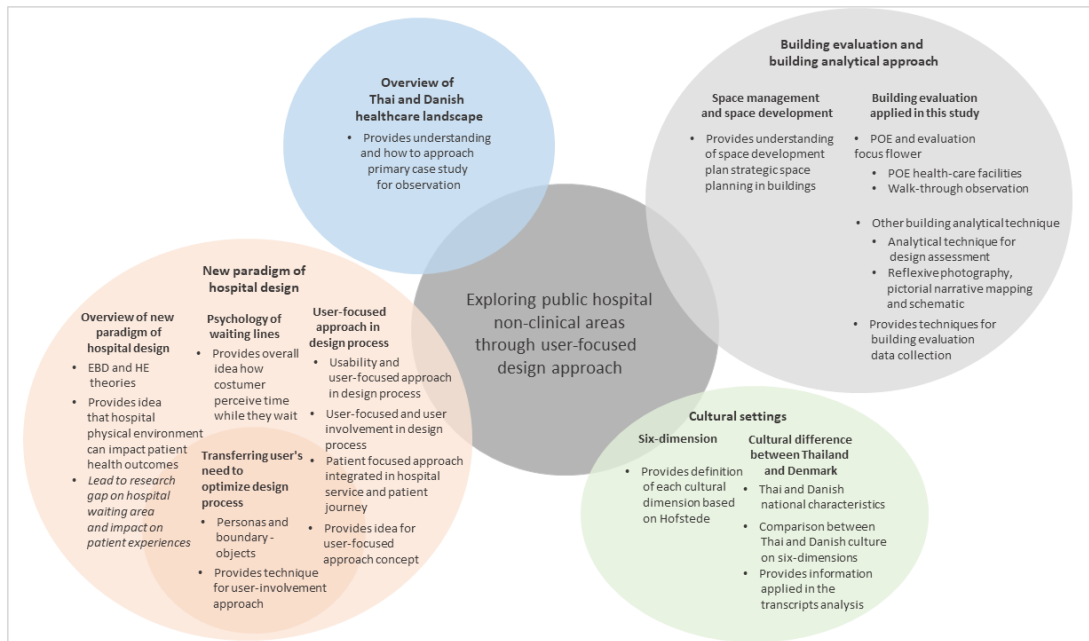


Figure 2- 10: Over all theories and concepts model applied in this study

A summary of theoretical frameworks and key concept is presented in table 2-4, where I elaborate each key concept and how I implemented each theory into this PhD study.

Table 2-4: Summary of theoretical frameworks and key concepts applied in this study

Theoretical framework	Key concept applied in this PhD Study	Details of key concept	How the theory was implemented in the study
1. Healthcare landscape and context of Thailand and Denmark	<ul style="list-style-type: none"> • Overview of Thailand healthcare system • Overview of Danish healthcare system 		<ul style="list-style-type: none"> • Provide understanding of Thailand and Denmark overall healthcare system, healthcare management system • Provide lens that I used to approach primary case studies for empirical data collection
	2. Building evaluation and building analytical approach	<ul style="list-style-type: none"> • Strategic importance of space • Strategic adaptation of space • Post occupancy evaluation (POE) and evaluation focus flower model • Building evaluation method employed in this study 	<ul style="list-style-type: none"> • Provide understanding on strategic development of space management in each organization, where major decision about space planning should take place every 3-5 years • Provide concept of how organization's space develops through three approaches: incremental, standardization and value-based • Provide overall ideas of how space in large public hospital develops • POE provide understanding of building assessment technique on how to get feedback or user to improve building condition • Evaluation focus flower provides overview of POE techniques, where similar techniques were grouped and organized depending on the focus of evaluation
		<ul style="list-style-type: none"> • Post occupancy evaluation in health-care facilities • Walk-through observations 	<ul style="list-style-type: none"> • POE health-care facilities provides clear framework and techniques on how to evaluate healthcare facilities through '5-step toolkit' technique, where walk-through observation is part of building evaluation listed in 'tool-2: Audit for physical environment'. • POE focusing on building assessment method and measurement provides me specific criteria for functional evaluation of health-care building, which I later developed and applied on the evaluation of Maharaj Chiang Mai hospital and Rigshospitalet • Walk-through observation provides me technique on how to do 'inspection' tour assessing functional quality of hospital building. This theory is also part of important technique of usability evaluation (USEtool), where building is assessed through walk-through inspection

Table 2-4 continue

Theoretical framework	Key concept applied in this PhD Study	Details of key concept	How the theory was implemented in the study
	<ul style="list-style-type: none"> Other building analytical technique 	<ul style="list-style-type: none"> Analytical technique for design assessment Reflexive photography, pictorial narrative mapping and schematic 	<ul style="list-style-type: none"> Analytical technique for design assessment provides technique for hospital floor plan analysis, where I mapped colour into hospital function, including patient bedrooms, clinic, corridors, waiting areas etc. Reflexive photography, narrative mapping and schematic provides me technique for data collection during the observation of non-clinical areas/waiting areas of all five case studies, where I took photographs of the hospitals waiting areas and discussed the physical environment of the areas
3.New paradigm of hospital design	<ul style="list-style-type: none"> Overview of new paradigm of hospital design 	<ul style="list-style-type: none"> Evidence-based design and Healing environment 	<ul style="list-style-type: none"> Provides overall idea that hospital physical environment, which plays important role on patient physical and mental health outcomes Healthcare environment and patient stress theories provides element of physical environment that have impact on patient stress, including noise level, floor layout, daylight, clear navigation signage, ventilation, decrease infection rates Hospital waiting area design and patient stress theory provides overall idea of physical environment of waiting area that has impact on patient mental health - <i>lack of study in regard of relationship between the design of public hospital waiting area and patient experiences lead to this study knowledge gap</i>
	<ul style="list-style-type: none"> Psychology of waiting lines 		<ul style="list-style-type: none"> Provides overall idea of how customer perceive waiting time, the key concepts applied during the development of patient/medical staff interview questions and transcripts analysis
	<ul style="list-style-type: none"> User-focused approach in design process 	<ul style="list-style-type: none"> Usability and user-focused approach in design process 	<ul style="list-style-type: none"> User-focused approach provides idea that user's needs are put in centre of the design, where integration of user experience in design process creates high degree of usability User-focused and user involvement in design process provide techniques that can lead to high degree of usability, which includes -

Table 2-4 continue

Theoretical framework	Key concept applied in this PhD Study	Details of key concept	How the theory was implemented in the study
	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • 	<p>focus groups, interviews, observation, persona, survey etc. I applied techniques during the observations and interviews for this PhD study</p> <ul style="list-style-type: none"> • Patient focused approach integrated in hospital service and patient journey provides me concept of 'patient care journey', which lead to the development of this PhD study as interviews with patients and staff are necessary for the development of waiting area as an important facility during patient care journey
		<ul style="list-style-type: none"> • Transferring user's need to optimize design process 	<ul style="list-style-type: none"> • Personas provide me techniques and tools that can be used during empirical data collection - the interviews and meeting with nurses • Boundary objects as tool and method in user involvement sessions provides me techniques and tools that I applied during my involvement in Rigshospitalet's waiting area design project and meetings with clinical nurses
4.Cultural settings	<ul style="list-style-type: none"> • Six dimensions of national culture • Cultural difference between Thailand and Denmark 	<ul style="list-style-type: none"> • Thai national characteristics and the concept of 'Thainess' • Danish national characteristics • Comparison between Thai and Danish culture on six dimensions 	<ul style="list-style-type: none"> • Provides overall ideas and meaning of six dimensions of national culture theory founded by Hofstede (2010) • Thai and Danish national characteristics provide idea of national core values of Thai and Danes • Comparison between Thai and Danish culture on six dimension provides differences and similarities between Thailand and Denmark based on the six dimensions

3. METHODOLOGY

This chapter presents the methodology of this PhD study. First, I delve into the ontology and epistemology that will lead to my research paradigm (Bryman & Bell, 2015; Saunders, Lewis, & Thornhill, 2019). I will then explain research approaches, methods, steps of empirical data collection and data analysis.

I employed several theoretical approaches of research methods provided in the research field of facilities managements, architecture and social science. Consequently, I followed the methodology definition provided by Groat and Wang (2013), where they argue that the term *methods* or *methodology* are used with a focus on research processes, which are common across the entire range of technical and humanities research, from the most applied to the most theoretical.

To be able to frame a clear research paradigm, as a basis for my research strategy and technique, the philosophy of science should be elaborated and explained.

3.1 PHILOSOPHY OF ASSUMPTIONS AND INTERPRETATIVE FRAMEWORKS

I began my PhD study with a certain belief of philosophical assumptions based on my own experiences (Creswell & Poth, 2018). However, throughout my three years of doctoral study, my philosophical assumptions have changed and developed over time as I have gone through each step of my research, employing different research strategies and tactics (Groat & Wang, 2013). Philosophical assumptions inform our choice of theories that guide our research (Creswell et al., 2018). Research assumptions consist of three philosophical elements: ontology, epistemology and axiology. In my stance, I position my research as an eclectic field between facilities management and architectural disciplines, where I describe my research philosophy assumptions as follows. Figure 3-1 describes researcher beliefs and assumptions, which go back and forth between research philosophies and research design. I adopted this model (Figure 3-1) as a starting point to outline and justify my perspective of research philosophical assumptions.

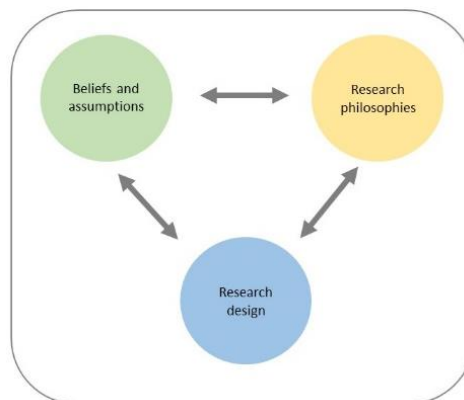


Figure 3-1: Description of the relationship between beliefs and assumptions, research philosophies and research design (Bristow & Saunders, 2018)

3.1.1 Ontological, epistemological and axiological assumptions

To construct a strong foundation for research design and framework, researchers should understand their ontological, epistemological and axiological assumptions (Saunders et al., 2019). Nardelli (2014) described that ontology and epistemology should fit in with the research objectives and questions they are associated to.

Ontological assumptions

Ontology is a branch of philosophy that concerns the nature of social phenomena as entities (Saunders et al., 2015). Ontological assumptions refer to the nature of reality, and it determines how *you* see the world (Creswell et al., 2018). My research queries stemmed from daily situations in Thai public hospitals, where my research topic involved facilities management and the design of public hospitals. I have framed my ontological assumptions based on these aspects, which later shaped my research questions and framed my research paradigm including research approach. My ontological assumptions are that daily situations at Thai public hospitals are the consequence of the overall context of the Thai healthcare landscape. However, the overall context of the Thai healthcare landscape and the daily situations affect both individuals using the building as well as the development of hospital buildings. Therefore, these assumptions determine my focus on: (1) the Thai public healthcare context, (2) the daily situations and physical environment in Thai public hospitals and (3) individuals involved in the public hospital context.

Epistemological assumptions

Epistemology refers to assumptions about knowledge and what constitutes acceptable, valid and legitimate knowledge (Saunders et al., 2019). Based on Bryman et al. (2015), epistemologies consist of two sets of beliefs: positivism and interpretivism. Researchers who apply positivism aim to test theories and to provide material for the development of laws or make generalisations. Positivism in epistemological assumptions refers to positivists focusing on strictly scientific empiricist methods designed to yield pure data and facts uninfluenced by human interpretations or biases (Saunders et al., 2019; Crotty, 1998). Positivist researchers are likely to use a highly structured methodology in order to facilitate replication. The research usually applies quantifiable observations, which refer to statistical analysis (Saunders et al., 2019). On the contrary, researchers who apply interpretivism develop their epistemological assumptions from a subjective perspective (Bryman et al., 2015). The assumptions of interpretivism epistemology relate to the subject matter of social science. In the fields of facilities management and architectural disciplines, interpretivism epistemology relies on the relationship between people and their institution or people and architecture (Saunders et al., 2016; Groat et al., 2016). Interpretivism focuses on the explanation and understanding of human behaviour (Bryman et al., 2015). I framed my ontological assumptions based on the context, situation and individuals of Thai public hospitals. Therefore, I frame my epistemological assumptions on emphasising individual lived experiences and the phenomenology that they share in public hospitals (Creswell et al., 2018). I also believe that my epistemological assumptions lean towards interpretivism as I focus on individual lived experiences rather than aiming to develop laws of generalisation.

Axiological assumptions

Axiological assumptions refer to values and ethics. In relation to interpretivism and ontological assumptions, axiological assumptions refer to how researchers position their roles and values. As my epistemological assumptions lean towards interpretivism, my thoughts emphasise a subjectivism approach. As a researcher, I let my own value influence my study context. Creswell et al. (2016) adds that in a subjective research context, researchers acknowledge that research is value-laden and that biases are present in relation to their role in the study context. Heron (1996) also argues that our values are the guiding force behind all human actions, and that it is inevitable that researchers will incorporate their values during the research process. My research philosophy is a reflection of my values, where, throughout my doctoral study, I reflect on and openly discuss values that shape the narrative and include my own interpretation.

The combination of ontology, epistemology and axiology articulates my research paradigm and research approach and later helps me justify my choice of methodology and data-collection technique.

3.1.2 Research paradigm and research approach

I formed my research paradigm based on various schools of thoughts on research philosophy, where ontological, epistemological and axiological assumptions are connected (Creswell et al., 2016; Crotty, 1998). In the field of management research philosophies, Saunders et al. (2019) framed five research paradigms: positivism, critical realism, interpretivism, postmodernism and pragmatism.

In the first year of my PhD study, I was in a dilemma between two research paradigms: interpretivism and pragmatism. However, as the study developed, my queries regarding individual experiences and phenomenology increased (van Manen, 1990; Creswell et al., 2016) with a focus on in depth investigations using qualitative methods within the scope of the phenomenological approach. From the perspective of the architectural field, phenomenological inquiry is commonly used among architectural researchers to acquire insights based on individual experiences and physical context (Groat et al., 2013). Furthermore, phenomenological inquiry focuses on peoples' interactions with the physical environment (Groat et al., 2013). Therefore, my research paradigm has developed from pragmatism to interpretivism. The research paradigm that I chose is described in table 3-1. The connection between ontology, epistemology and axiology helped me justify and establish the research methodology throughout my doctoral study.

Table 3-1: Philosophical positions in business and management research
(Saunders et al., 2019)

Interpretivism			
Ontology (nature of reality or being)	Epistemology (what constitutes acceptable knowledge)	Axiology (role of values)	Typical methods
Complex, rich Socially constructed through culture and language Multiple meanings, interpretations, realities Flux of processes, experiences, practices	Theories and concepts too simplistic Focus on narratives, stories, perceptions and interpretations New understandings and contributions	Value-bound research Researchers are part of what is researched, subjective Researcher interpretations key to contribution Reflexive research	Typically, inductive. Small sample, in depth investigations, qualitative methods of analysis, but a range of data can be interpreted

3.2 RESEARCH METHODOLOGY

With the aim of establishing rich data, I divided my methodology into three sections throughout the three-year period. Each section was carried out sequentially, where each section was built and developed based on the reflection of the previous step. As mentioned in Section 2.1.2, I employed interpretivism as my research paradigm, which influenced my research design helping me establish my research methodology. Therefore, the research is based on multiple qualitative methods to capture credible empirical data (Health, 2015). However, each section narrowed down the scope of my research, where the last section (the interviews) represents the core of my study (Saunders et al., 2019). A brief timeline of data collection carried out throughout the PhD study is illustrated in Figure 3-2.

Brief explanation of the three separate but intertwined sections of data collection are:

Part 1:

1. Literature review
2. Pilot study
 - 2.1 Pilot observation and evaluation at four public hospitals (Maharaj Chiang Mai hospital, Chulalongkorn hospital Bangkok, Khoo Teck Puat hospital Singapore, and St Olavs hospital Norway)
 - 2.2 A comparative analysis of pilot study

Part 2:

3. Observation and evaluation of non-clinical areas and hospital waiting areas
 - 3.1 Involvement in waiting areas registering and renovation project at Rigshospitalet, including observations and evaluations of waiting areas at the hospital
 - 3.2 Observation and evaluation at Maharaj Chiang Mai hospital

Part 3:

4. Interviews
 - 4.1 Interviews with Thai and Danish patients
 - 4.2 Interviews with Thai and Danish medical staff
 - 4.3 Cross case analysis of the interviews

However, besides the three main parts of my primary methodology, I also conducted empirical data collection as follows:

- Observations and evaluation of the Thailand healthcare context, including observations at four Thai hospitals and mini walk-through observations at Maharaj Chiang Mai hospital. This study was conducted prior to my PhD study at Technical University of Denmark (DTU), a part of the results was published in Paper 1.
- Interviews with experts, including hospital planners, facilities management and hospital policy makers from Thailand, Denmark and Norway. This study was conducted during my PhD study at DTU; however, due to limited time, the data has not been analysed and is not included in the PhD thesis.

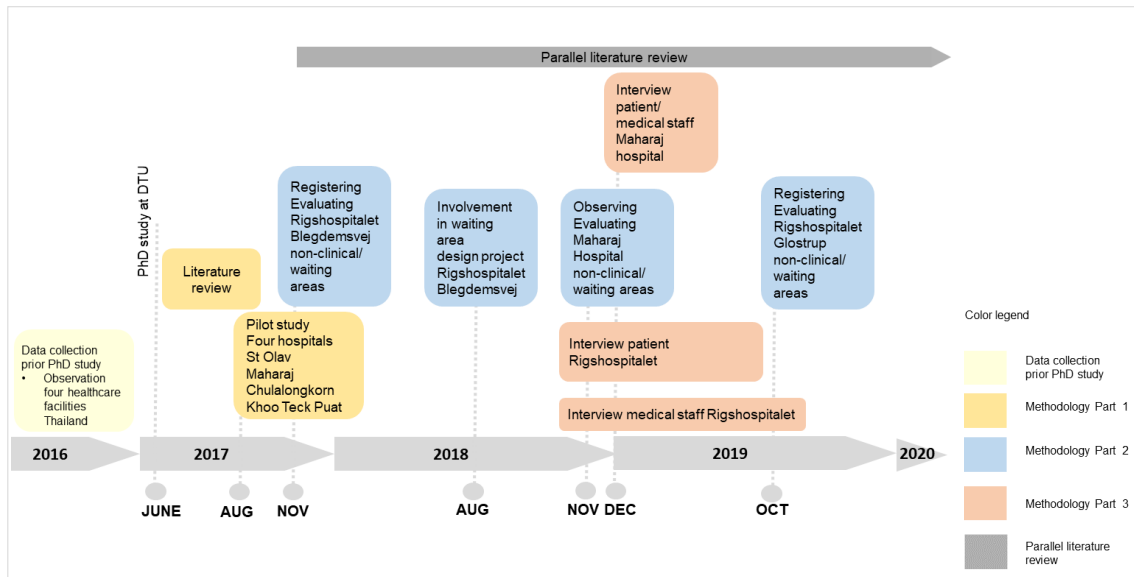


Figure 3-2: Timeline of data collection carried out throughout PhD study

3.2.2 From exploratory to inductive and abductive study

The preliminary research approach was exploratory, where a researcher starts collecting data and then analyses them to see which themes or issues to follow up and concentrate on (Glaser & Strauss, 1967; Schatzman & Strauss, 1973; Strauss & Corbin, 2008; Yin, 2014). Therefore, I began my PhD study exploring the situation in Thai public hospitals to understand the overall context of public hospitals. After analysing data from the exploratory approach, I shifted to the inductive approach as it could provide a better understanding of the nature of the problems (Saunders et al., 2019). Based on the analysis of data, I developed a theory that contributed to the existing knowledge and theories (Eisenhardt, 1989). In the last part of my study, I employed an abductive approach (Van Maanen, Jesper, Sorensen, & Terence, 2007), where I moved back and forth between data and theory as insights into data emerged and intertwined with the existing knowledge and theories (Bryman et al., 2015). However, the emerged data (by themselves) provided inputs regarding the next step of my empirical data collection, while, at the same time, I was trying

to develop theories. Van Maanen et al. (2007) note that in an abductive study, some plausible theories can account for what is observed better than others, and it is these theories that will help uncover more 'surprising facts'. To conclude, I began my study with the exploratory approach, then moved to the inductive approach as I developed theories, and, finally, I completed the study with the abductive approach.

3.2.3 Triangulation of methods for data collection

To provide rich and valid data, I applied *triangulation* of methods for data collection. Triangulation refers to the use of different data collection techniques within one study in order to ensure the validity of data (Bryman et al., 2015; Health, 2015; Yin, 2014). Applying triangulation of methods for data collection in qualitative research can help a researcher achieve data rigor (Health, 2015). Different data collection techniques were applied throughout the three parts of my study; I mapped each technique into the triangulation of methods for data collection (Figure 3-3). Pilot study and case study observations along with interviews are the main components of the empirical data collection technique. Literature review helped me establish a clear research scope and frame research questions. Architectural document analysis acted as a supplement to my empirical data collection. All methods and techniques of data collection are connected, and I will explain in detail in the next section (2.3 - Three parts of data collection).

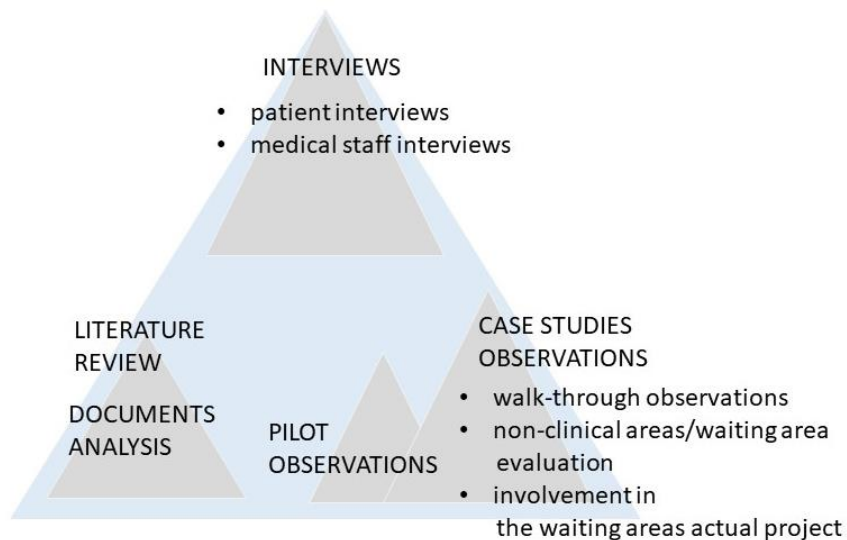


Figure 3-3: Triangulation of methods for data collection

3.3 THREE PARTS OF DATA COLLECTION

Data collection was divided into three main parts as each part influenced the tactics and techniques of the next part. Thus, each part is categorised into small steps and stepwise results to justify the techniques, which I employed in the next step. My papers do not completely follow the sections consecutively. However, I wrote the papers as I completed each part of the data collection. Table 3-2 illustrates the three parts of my data collection with steps and papers representing each part. An overview with details of methods and techniques used for this study data collection is provided in table 3-3.

Table 3-2: Data collection contributions to published papers

Methodology	Techniques used for data collection	Contribution to Paper				
		1	2	3	4	5
Literature review parallel to data collection		x	x	x	x	x
Data collected prior to PhD study at DTU	<ul style="list-style-type: none"> • Observations four Thai health-care facilities • Document analysis 	x				
Part 1	<ul style="list-style-type: none"> • Pilot observations and evaluation at four public hospitals: St Olavs, Maharaj Chiang Mai, Chulalongkorn, Khoo Teck Puat 		x			x
Part 2	<ul style="list-style-type: none"> • Registering and evaluating waiting area at Rigshospitalet • Evaluating waiting areas at Maharaj Chiang Mai hospital • Involvement in renovating waiting areas project at Rigshospitalet 		x	x		x
		x	x			x
				x		
Part 3	<ul style="list-style-type: none"> • Interviews with patients from Thai and Danish public hospitals (Maharaj Chiang Mai and Rigshospitalet) • Interviews with medical staff from Thai and Danish public hospital (Maharaj Chiang Mai and Rigshospitalet) 				x	x
						x

Table 3-3: An overview of methods of data collection used in each paper

	Paper	Methods
1	Identification of space management problems in public hospitals: The case of Maharaj Chiang Mai hospital	<ul style="list-style-type: none"> • Literature review • Walk-through observations* • Evaluation of Maharaj Chiang Mai hospital* • Supplement data from thorough evaluation of Maharaj Chiang Mai hospital's non-clinical areas
2	Hospital architecture quality: Exploratory observation on three continents	<ul style="list-style-type: none"> • Pilot study of observations and evaluations at four public hospitals • Part of the observations of Rigshospitalet and Maharaj Chiang Mai hospital
3	Through the eyes of nurses: User-focused design approach for non-clinical areas of public hospitals	<ul style="list-style-type: none"> • Involvement in waiting area renovation project of Rigshospitalet • Participation in two meetings • Six interviews with nurses at Rigshospitalet
4	Optimising patient's journey and waiting experience in public hospitals: A qualitative study comparing Thailand and Denmark	<ul style="list-style-type: none"> • 21 interviews with patients at Maharaj Chiang Mai hospital and Rigshospitalet
5	Meeting patient and staff expectations and needs regarding waiting area facilities in public hospitals	<ul style="list-style-type: none"> • Pilot study evaluation of four hospitals • Evaluation of Rigshospitalet and Maharaj Chiang Mai waiting areas • 21 interviews with patients at Maharaj Chiang Mai hospital and Rigshospitalet • 17 interviews with medical staff at Maharaj Chiang Mai hospital and Rigshospitalet
	* Remark - data collected prior to PhD study at DTU	

3.3.1 Data collected prior to PhD study

A screening of hospitals in Thailand for the selection of the main case study took place in 2016 as part of the exploratory approach (Yin, 2014; Saunders et al., 2016). I selected four hospitals for this study (Yin, 2014; Eisenhardt, 1989), which include: a government hospital, a private hospital, a specialised hospital and a Thai traditional healthcare centre as these four healthcare facilities represent the Thai hospital system and healthcare landscape. After observation, it occurred to me that Thai public hospitals have poor physical conditions and extreme overcrowding. These conditions raised questions as to '*what*' caused these problems, '*why*' the problems occurred and '*how*' these problems can be tackled (Saunders et al., 2016, 2019). These questions were the basis of my loosely formulated overall research question for the study.

I then conducted a single case study observation to understand the nature of the problems that were revealed during the hospital screening process (Yin, 2014; Eisenhardt, 1989). I selected Maharaj Chiang Mai hospital since it represents one of the largest and most complex teaching public hospitals in Thailand. I applied the usability method called 'walk-through' observation, (Hansen, Blackstad, & Knutsen, 2011; Haron & Hamid, 2011; Fronczek-Munter, 2016) where I observed and evaluated all the non-clinical areas in the hospital, including waiting areas, canteens and the parking garage. I carried out the walk-through observations by imitating patients' care journey (Hansen et al., 2011) consisting of six routes: four imitating patients of outpatient department and two imitating patients of inpatient department. Table 3-4 provides details of the imitation of patient routes.

Table 3-4: Imitation of patient routes carried out for observation of Maharaj Chiang Mai hospital

Ward	Route
Outpatient	1. Walk-in to non-specialised clinics
	2. Walk-in to specialised clinics (internal medicine, paediatric, gynaecology, orthopaedic, surgery)
	3. By appointment to non-specialised clinics
	4. By appointment to specialised clinics
Inpatient	5. Walk-in admitted to non-specialised and specialised clinics
	6. By appointment admitted to specialised clinics

I documented (photographed) the current conditions of the hospital's non-clinical areas (ref). Furthermore, I applied analytical drawing techniques for design assessment (Van der Zwart & Van der Voordt, 2015; Van der Voordt, Vrieklink, & Van Wegen, 1997) by (1) mapping patient routes (6 routes that I carried out for the observations) to the architectural plans of the hospital and (2) providing architectural colour legends to building circulations, clinical areas and non-clinical areas. The analysis provided me insights on spatial arrangement and overall space management and organisation of clinics in the hospital. Data from this study was published in a Salford CIB conference proceeding paper called '*Defining specific problems in the Thai government hospital buildings. A study of architectural planning and space management of Maharaj Chiang Mai hospital, Chiang Mai Thailand*'.

The paper, however, is not included in the thesis as it was later integrated into Paper 1, where I included additional data that I collected during my PhD study (data collected in Parts 1 and 2). Figure 3-4 illustrates an example of analytical drawing techniques for design assessment, where I imitate outpatient routes to specialised clinics routes at Maharaj Chiang Mai hospital. Figure 3-5 provides details of colour legend for analytical drawing techniques.

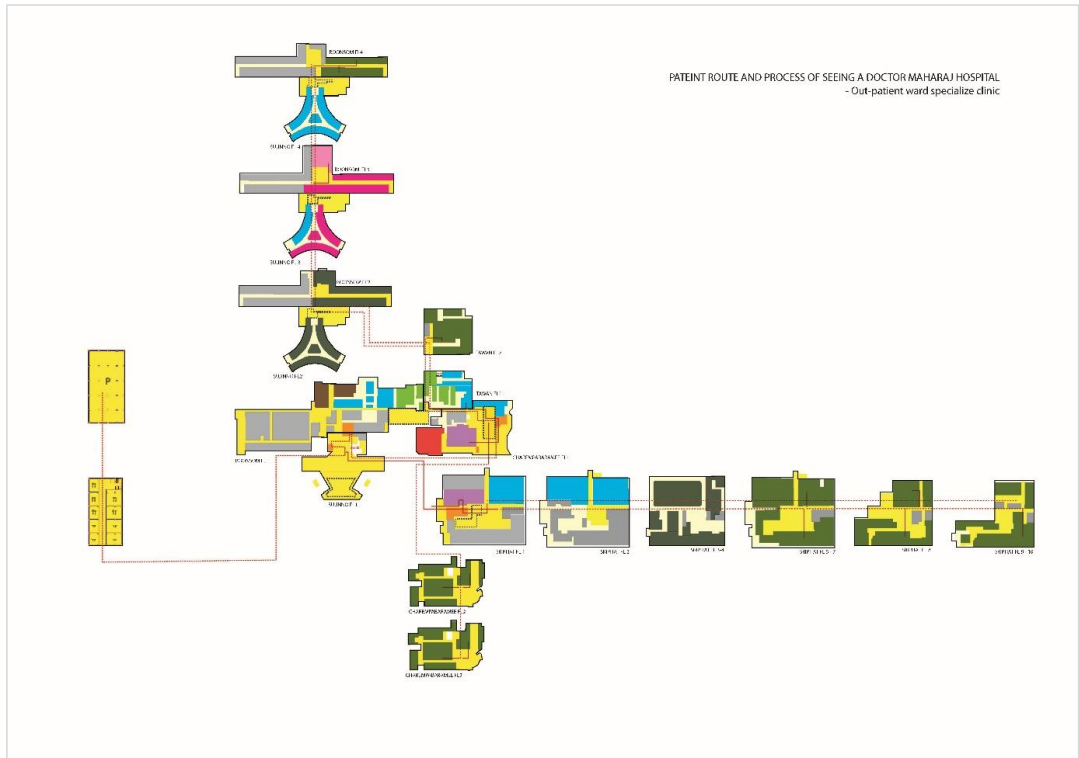


Figure 3-4: Analytical drawing technique for design assessment


















Legends		
1) Circulation		
1.1) Public corridor, hall, stairs, elevators, waiting area		
1.2) Internal		
1.2.1) treatment		
1.2.2) consulting		
1.2.3) non medical staff		
2) Support		
waste, laundry, kitchen storage, cleaning		
3) Zoning		
3.1) Intake		
3.1.1) Information		
3.1.2) Check in		
3.2) Outpatient department		
3.2.1) Internal medicine and overtime OPD clinic		
3.2.2) Specilized clinic		
- Surgical		
- Orthopedic		
- Pediatric		
- Other specialized clinic (include; psychiatry, oncology etc)		
- Dental clinia		
- Gyneacology		
3.3) Inpatient department		
- Internal medicine		
- Surgical		
- Orthopedic		
- Pediatric		
- Other specialized clinic (include; psychiatry, oncology etc)		
- Gyneacology (include delivery room)		
3.8) Morgue		
3.9) Office		
3.10) Service		
3.10.1) parking		
3.10.2) shop		
3.10.3) retstaurant		
3.4) Emergency and Trauma		
3.5) Operating room (OR)		
3.5.1) Intensive care unit (ICU)		
3.5.2) Sub ICU		
3.5.3) Specialize ICU		
3.6) Medical services		
3.6.1) Pharmacy		
3.6.2) Laboratory		
3.6.3) X-RAY/Ultrasound		
3.6.4) EKG (electrocardiography)		
3.6.5) One day chemotherapy		
3.6.6) Dialysis		
3.7.7) Other medical services		

Figure 3-5: Colour legend describing colour used to analyse Maharaj Chiang Mai hospital functions and layout for analytical drawing technique for design assessment

3.3.2 Part 1:

This part consists of two small steps, each step influences the step that follows.

Step 1. Literature review

I had been reviewing some related literature prior to the PhD study, during the hospital screening process in 2016. However, when I began the PhD study, I restructured my literature review lists and divided them into two parts. The first part is a rigorous review approach and the second part is a review of relevant theories. Both parts of the literature review worked as a paradigm funnel, where the literature review began with a review of more general theories moving on to more specific theories aiming to answer the research questions (Saunders et al., 2016; Berthon, Nairn, & Money, 2003; Kuhn, 1970). Both parts of my literature review established my theoretical framework.

Step 1.1 Review of theory to frame research purpose and overall research questions: This part of the literature review served as a foundation of my study and helped establish the research purpose and overall research questions. The research questions were developed over the three-year period of my PhD study. I analysed how the literature facilitates empirical data collection for further development (Saunders et al., 2019; Bryman et al., 2015). The review also provided me tactics and tools for the first step of empirical data collection methods, which I will explain in Step 2 (pilot study). The literature review included the following topics: structure and organisation of healthcare in Thailand, hospital architecture and design approach and performance management and building assessment concepts.

Step 1.2 Review of relevant theory parallel to the entire research project: This part of the review serves as a basis for subsequent parts of the study; the literature review was carried out throughout the PhD study. This part facilitated empirical data collection steps and analyses, which include puzzle solving. Kuhn (1977) stated that science comprises puzzle solving, whereby data and theory are matched. Continuous literature review contributed significantly to my study, including the structure and organisation of the healthcare system selected for case studies, the user-focused design approach, patient-centred design approach, facilities management in service design, the psychological aspects of hospital waiting area and social structure. Figure 3-6 illustrates how I structured my literature review.

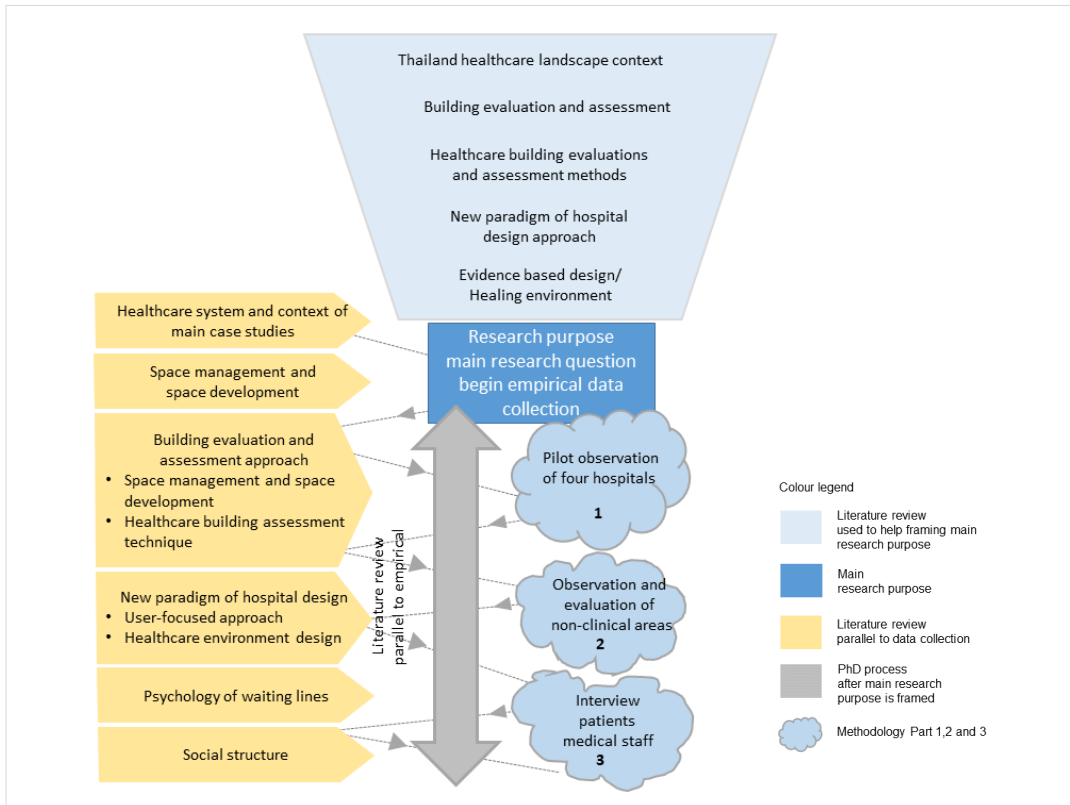


Figure 3-6: Literature review processes

Step 2. Pilot study

The literature review had provided me with a clear research purpose and questions (Saunders et al., 2019). Therefore, at this step (pilot study), I aim to answer the questions 'what are the characteristics of non-clinical areas at hospitals and what are the similarities and differences of non-clinical areas between hospitals in different contexts?' Although I had no experience in the field of facilities management, with my architectural background I focused on hospital space management and planning. Data collection prior to my PhD study (observing four Thai healthcare facilities and a small investigation at Maharaj Chiang Mai hospital) had provided me a set of criteria for selecting other hospitals for the pilot study (Groat et al., 2013).

Step 2.1 Pilot observation and evaluation at four public hospitals: This step of empirical data collection applied an exploratory approach. I employed multiple case study techniques and, to provide effective outcomes, 6 to 10 case studies are recommended (Yin, 2014). However, due to time constraints, economic situation and ethical considerations, as some hospitals did not allow me to conduct observations due to patients' privacy and rights, I was only able to investigate *four* hospitals.

Step 2.1.1 Case selection for pilot study: The selected cases represent different contexts of public hospitals. I was confident that each case would provide me useful information

regarding the characteristics of non-clinical areas or the overall context of non-clinical areas in hospitals.

The selection criteria were developed based on multiple case study approaches (Yin, 2014) combined with analysis of data collected prior to the PhD study. Although this step was just a pilot study, I anticipated that each case would provide me useful information as I applied a holistic approach, which means each case should represent:

- A specific context (different country and healthcare context)
- Predict similar results (a literal replication)
- Predict contrasting results but for anticipatable reasons (a theoretical replication)

Moreover, I had decided to continue investigating Maharaj Chiang Mai hospital; therefore, the hospital was included in the pilot study. The selected cases should also have similarities to Maharaj Chiang Mai hospital with regard to:

- Large public hospital with a minimum of 500 to 1,000 beds
- University or teaching hospital, where the hospital provides specialised treatments and has several physical environment settings for clinics and wards

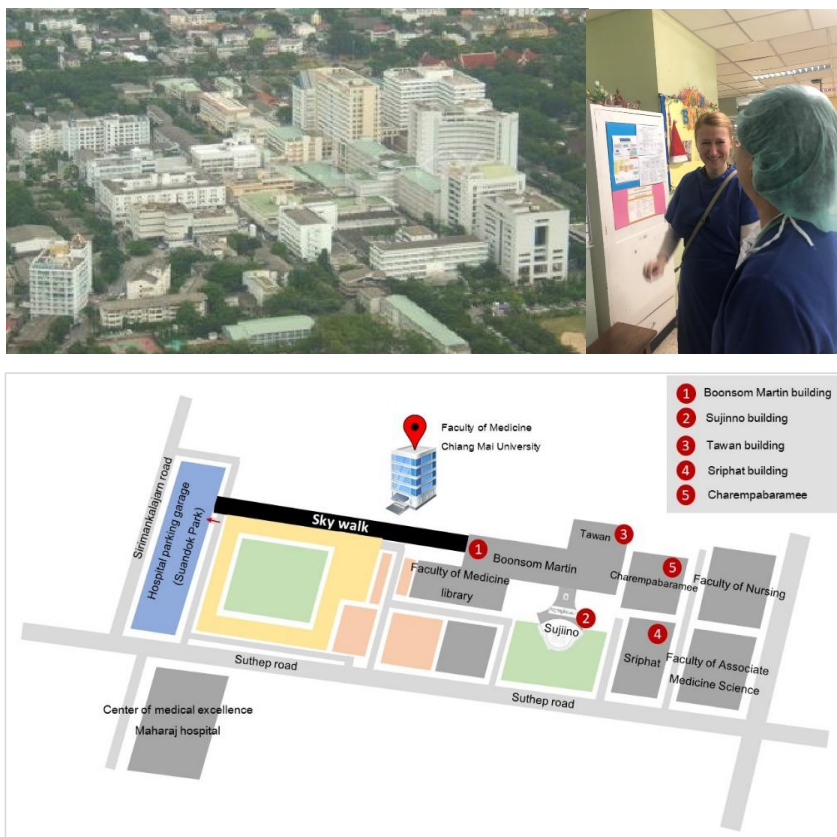
I began contacting the 10 hospitals that met the case selection criteria by sending study proposals to hospital contact information available on the website. Each hospital had a specific contact person for research purposes and they passed on my request to the relevant department. However, only *four* hospitals gave me permission to conduct observations. I was informed that I should be aware of patients' privacy and rights. The representatives from the hospitals emphasised that due to patient privacy, photographs of patients were prohibited and a patients' faces in photographs should be censored. I later submitted letters asking for permission to collect data for the PhD study adhering to patient privacy rules.

All the prospective cases provided outstanding characteristics of public hospitals (Yin, 2014). The four pilot cases represented two architectural award-winning hospitals and two overcrowded hospitals. Besides receiving permission to collect empirical data for my PhD study, my supervising team suggested that I should also establish connection with the employees or facilities managers of the hospitals.

The first case study was Maharaj Chiang Mai hospital, Thailand, where I had already been in contact with the department of hospital facilities management for data collection prior to my PhD study. The second case was St Olavs hospital, Norway, where my main supervisor advised me that I should contact Aneta Fronczek-Munter, a former PhD student at DTU as she was then working as a postdoctoral researcher at NTNU (Norwegian University of Science and Technology) and her postdoctoral project involved St Olavs hospital. The third case was Chulalongkorn hospital, Thailand, where Akarapong Katchamart, another former PhD student at DTU, was working as a facilities manager at the hospital. The fourth case, Khoo Teck Puat hospital, Singapore, was recommended by Aneta, and later, we contacted the head of hospital planning. The four selected hospitals were located in three different countries: Thailand, Norway and Singapore.

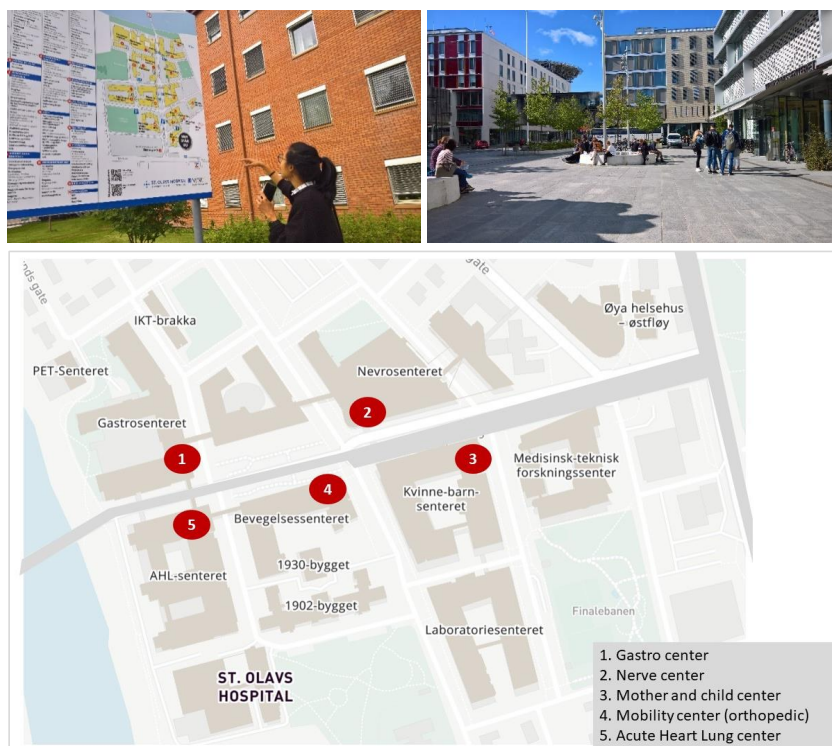
Step 2.1.2 Case description:

Case 1 - Maharaj Chiang Mai hospital, Chiang Mai, Thailand: Part of the general information regarding Maharaj Chiang Mai hospital is provided in Paper 1. Therefore, only brief information will be presented in this section. The hospital is one of the largest teaching hospitals in Thailand with around 2,000 beds. There are five main medical buildings situated in the hospital compound: (1) 8-storey Boonsom Martin, built in 1972, (2) 6-storey Tawan, built in 1975, (3) 15-storey Sujinno, built in 1984, (4) 15-storey Sriphat, built in 1994 and (5) 15-storey Charempabaramee, built in 2006.



Figures 3-7 (above left): Maharaj Chiang Mai hospital, photo taken by the Facilities Management department, 2015
 Figure 3-8 (above right): Field visit at Maharaj Chiang Mai hospital, photo taken by Supuck Prugsiganont, 2018
 Figure 3-9 (below): Map of Maharaj Chiang Mai hospital (made by Supuck Prugsiganont)

Case 2 - St Olavs hospital, Trondheim, Norway: St Olavs hospital is the new regional university hospital for the Mid-Norway health region. The hospital was created in 1902 as New Trondheim Hospital. In 1964, the municipality took over the responsibility for the hospital. In the 1990s, the hospital had reached a saturation point for expansion, and some buildings were outdated. Major debates took place through the late 1990s to the 2000s, whether to renovate or demolish and build a new hospital, including relocation of the hospital to the outskirts of Trondheim. The debates went from the municipality to Storting (supreme legislature of Norway), and finally, in 2002, Storting decided to build an entirely new hospital at the same location (Øya) (Fronczek-Munter, 2014). It took 10 years to complete building the entire hospital compound (from 2004 to 2014) consisting of 11 buildings, including 6 medical buildings (Fronczek-Munter, 2016). All medical buildings are 7-storey high and divided into: (1) Gastroenteret (Gastro centre), (2) Nevrosenteret (Nerve centre), (3) Kvinne-barn senteret (Mother and Child centre), (4) Bevegelsessenteret (Mobility centre/orthopaedics) and (5) Akutten og Hjerte-Lunge senteret (Emergency, Heart and Lung centre). In 2014, the hospital received a total of seven awards at the Design and Health International Academy Awards in Toronto, Canada. Figure 3-12 provides map of St Olavs hospital, available at <https://use.mazemap.com/#v=1&zlevel=7¢er=10.391227,63.420475&zoom=15.3&campusid=3>.



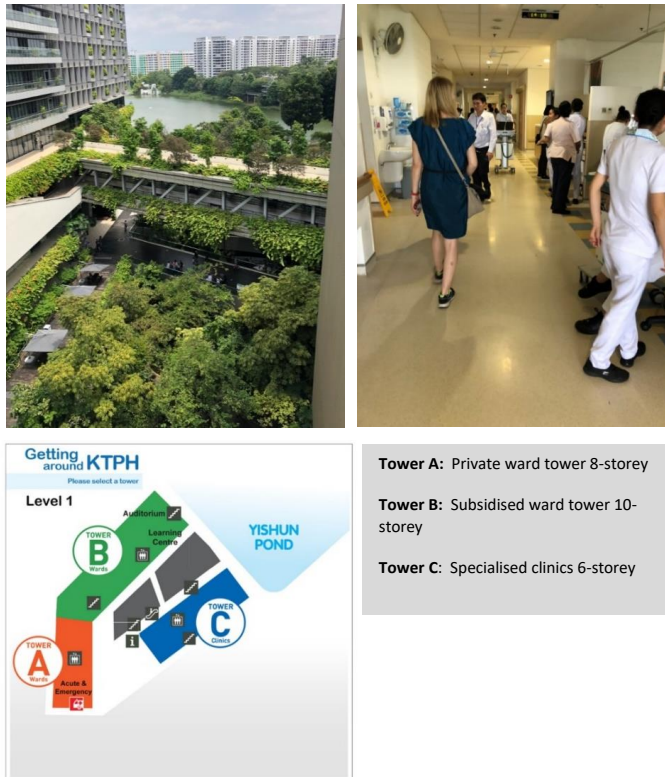
Figures 3-10 and 3-11 (above): St Olavs hospital,
photos taken by Aneta Fronczek-Munter and Supuck Prugsiganont
Figure 3-12 (below): Map of St Olavs hospital

Case 3 - Chulalongkorn hospital, Bangkok, Thailand: This is one of the largest teaching hospitals in Thailand and one of the most advanced teaching hospitals (Chulalongkorn hospital, 2020). The hospital has 1,400 beds operated by Thai Red Cross Society. The hospital was founded in 1941 by king Vajiravudh, and in 1947 the hospital was associated with Chulalongkorn University as faculty of medicine teaching hospital (<http://chulalongkornhospital.go.th/kcmh/hospital/history/>). The hospital is considered to be one of the largest and most complex public hospitals in Thailand with nine medical buildings. Figure 3-13 provides layout of the hospital as a large teaching hospital locate in heart of Bangkok (photo can be accessed at: <https://chulalongkornhospital.go.th/kcmh/>). Figure 3-15 presents map of the hospital with the name of buildings, available at <https://chulalongkornhospital.go.th/kcmh/internal-map/>.



Figures 3-13 (above left): Chulalongkorn hospital
 Figure 3-14 (above right): Field observation photo taken by Supuck Prugsiganont
 Figure 3-15 (below): Chulalongkorn hospital map

Case 4 - Khoo Teck Puat Hospital, Singapore: Khoo Teck Puat Hospital (KTPH) is a 795-bed public hospital that opened in 2010. The hospital serves people who live in northern Singapore (<https://www.ktph.com.sg/overview>). KTPH is an award-winning hospital, and the hospital focuses on greenery and easy navigation (way-finding), providing a hassle-free experience for patients. Recently, the hospital won the Stephen R. Kellert Biophilic Design Award 2017 (design award for buildings that deliberately integrate nature into the building to create a positive atmosphere for building occupants; Kellert & Edward, 1993) and the Design and Health International Academy Award 2011. The hospital is well known for its environmental friendly concept and its large courtyard and roof gardens, where the biophilic and healing environment concepts were integrated into the entire hospital (Khoo Teck Puat Hospital, 2020). KTPH consists of three medical buildings: (1) 6-storey specialist for clinical services tower, (2) 8-storey private ward tower and (3) 10-storey subsidised ward tower. All three buildings are adjacent to 8 roof gardens, 5 levels of corridor planters and 81 balcony planter boxes (<https://www.greenroofs.com/projects/khoo-teck-puat-hospital-ktph/>). See figure 3-18 for map of the hospital, available at https://www.ktph.com.sg/main/explore_ktph_pages/132/getting_around_ktph.



Figures 3-16 and 3-17 (above): Khoo Teck Puat Hospital during walk-through observation
both photos taken by Supuck Prugsiganont
Figure 3-18 (below): Map of Khoo Teck Puat hospital

Step 2.1.3 Data collection:

As this was a pilot study using the exploratory approach, I applied a combination of methods for data collection, which are presented in Paper 2. The study was a six-week project conducted in August 2017 and January 2018. The first author of Paper 2 and I collected data together throughout the four cases. We began collecting data in St Olavs Hospital followed by Chulalongkorn Hospital, Maharaj Chiang Mai Hospital, and completed the data collection with KTPH.

The methods for data collection were usability method of building assessment 'walk-through' observation, which is part of USEtool methods (Blaksted, Olsson, Hansen, & Knudsen, 2010; Haron & Hamid, 2011; Fronczek-Munter, 2016;), reflexive photography (Amerson & Livingston, 2014; Harrington & Schibik, 2003) and pictorial narrative mapping (Lapum et al., 2015). Pictorial narrative mapping is a combination of two qualitative data collection techniques: narrative mapping and narrative art. Pictorial narrative mapping refers to the use of pictures or drawings for mapping and explaining specific events that participants have experienced (Mamber, 2003; Lapum et al., 2015) and semantic schemes (Fronczek-Munter, 2016).

During every hospital visit, we conducted walk-through observations imitating patient journeys for outpatient routes. Photographs and field notes were taken regarding the physical condition of non-clinical areas. In three hospital visits (except St Olavs Hospital), we were accompanied during our visit by a representative of the hospital due to ethical considerations and patient privacy as we were always approached by nurses asking us to leave if we were not patients.

Step 2.1.4 Comparative analysis of the pilot case study:

Data from the pilot study was presented in Paper 2 and later developed and partly used in Papers 4 and 5. The criteria for data analysis were developed based on literature reviews. The first author of Paper 2 and I discussed the collected empirical data and set up criteria for discussion based on the building evaluation method (Preiser, 1995), evaluation focus flower model guidelines (Fronczek-Munter, 2013) and the semantic scheme method. The criteria were spatial arrangement of non-clinical areas, room aesthetics and design of the room, room height, and number of windows/open spaces and amount of natural light (Fronczek-Munter, 2016). Data from walk-through observations, fieldwork notes and photographs were mapped into semantic scheme templates. After completing data mapping in semantic scheme templates the first author of Paper 2 and I discussed and compared our findings. Based on the discussed findings, we applied pictorial narrative mapping and presented our findings with texts, architectural drawings and sketches (see Paper 2), where I made the sketches and drawings.

Two research questions were framed from the findings of the pilot study: (1) What are the similarities and the differences in the use of non-clinical areas in hospitals from different contexts? (2) What can the hospitals learn from each other and how can the knowledge of non-clinical hospital design, focusing on patient needs, be shared between these hospitals? However, findings from the pilot study can only answer the first question, while the second

question was not clearly answered due to lack of insights (Saunders et al., 2019). Analysis from the pilot study can only provide information regarding the assessment of the physical environment of non-clinical areas in hospitals. The findings were not sufficient to provide information on what and how each hospital exchanges knowledge of the design of non-clinical areas. This is due to my lack of experience in the field of research. Findings from the pilot study provide data that was used to develop public hospital waiting area typologies presented in Paper 2. The second research question was later answered in my last paper (Paper 5), when I completed all the steps of my empirical data collection.

Step 2.1.5 Limitation of methods employed in the pilot study:

The pilot study provided valuable information that I used as a base to further develop my study. However, there were several limitations to the methods that were employed for the pilot study.

The first limitation of the study was the combination of several methods of data collection. It is difficult to focus on one particular technique and establish clear data for the analysis. Second, the results from the analysis of pictorial narrative mapping and semantic schemes were rather abstract leading to difficulties in developing the data for further study and justifying concrete results. According to the building evaluation and assessment technique, some data should justify concrete findings (Priser et al., 1988). Third, clear criteria for walk-through observations and reflexive photography should be set for observation. However, the third limitation can be tackled in the next step of data collection.

3.3.3 PART 2:

Part 2 consists of observations and evaluations of non-clinical areas in public hospitals focusing on waiting areas, and this part was divided into three steps (evaluation of Rigshospitalet waiting areas, involvement in renovation projects at Rigshospitalet and evaluation of Maharaj Chiang Mai hospital). Moreover, Part 2 was conducted to further develop findings derived from the analysis of Part 1. The aim of Part 2 was to evaluate non-clinical areas with a focus on public hospital waiting areas. Analysis from Part 1 provided explicit details for the next step of data collection and selection for the main case study.

Step 3. Observation and evaluation of non-clinical areas and hospital waiting areas

Step 3.1 Selection of the main case study: Regarding Part 1 'pilot study', I had selected three hospitals from the pilot study for further investigation, Chulalongkorn hospital, Maharaj Chiang Mai hospital and St Olavs hospital, because these three hospitals provided unusual findings (Yin, 2014). Chulalongkorn and Maharaj Chiang Mai hospitals are extremely overcrowded with high influx of patients and poor physical environment, whereas St Olavs hospital has high quality of physical environment, and welcoming and friendly non-clinical areas.

The intention of Part 2 was to discover insights or 'dig deeper'; therefore, I employed the 'embedded' case study approach (Yin, 2014), where multiple units of each case study were included in the data collection and analysis (Yin, 2014). Thus, the main case studies are, still, to be considered under two conditions: (1) literal replication and (2) theoretical replication (see Section 2.1.1) (Yin, 2014). Based on the embedded case study approach, I included the physical conditions of non-clinical areas together with user perceptions for data collection and analysis. As mentioned in Chapter 3 (Literature review), the primary users are patients and healthcare staff. Patients are the main users of non-clinical areas, while healthcare staff might provide insights into space management (Harris & Richman, 2002; Forgarty & Cronin, 2008).

To be able to get in contact with patients, I applied for ethical permission at the three hospitals. However, Chulalongkorn hospital did not grant me ethical permission. After receiving the permissions from the other two hospitals, I contacted head nurses at each hospital to recruit participants for the interviews. For St Olavs hospital, I faced difficulties in recruiting participants. Over a year of constant contact, I could only recruit two patients and two medical staff members for the interviews, which is not enough to justify significant findings and provide insights. Therefore, I decided to exclude both Chulalongkorn and St Olavs hospital from my main case study. Further details will be described in Ethical permission (Section 4.2) and Participants (Section 4.1.3).

With only Maharaj Chiang Mai hospital as the main case study, I was considering Rigshospitalet as a potential case study. The opportunity came in late 2017, as one of my supervisors informed me that the Capital Region (Danish government organisation that manages hospitals and healthcare services in Greater Copenhagen) was searching for somebody to help with registering physical conditions of Rigshospitalet's waiting areas as part of a renovation project. I agreed to become part of the project as it aligned with my

research topic. Rigshospitalet allowed me to use the registered information for my PhD study and to further investigate the hospital.

Step 3.2 Registering physical conditions of waiting areas at Rigshospitalet: The registering process of waiting areas at Rigshospitalet was split into two separate steps: the registering of physical conditions of 41 waiting areas of Rigshospitalet Blegdamsvej and 35 waiting areas at Rigshospitalet Glostrup. Part of the data has been briefly presented in Paper 5. Data from the involvement in renovating waiting areas of the hospital is presented in Paper 3.

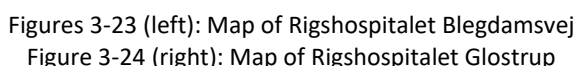
Step 3.2.1 Rigshospitalet: The hospital has two main locations: Rigshospitalet Blegdamsvej is located in the centre of Copenhagen and Rigshospitalet Glostrup is located 8 kms away from the Copenhagen city centre. A description of Rigshospitalet Blegdamsvej was included in Paper 3. The hospital buildings at Blegdamsvej were built in the 1960s and put into service in 1970. The hospital comprises of three medical buildings: (1) Building A - inpatient ward and specialised clinics, 16-storey building, (2) Building B - connects building A and C, 4-storey building and (3) Building C- specialised clinics and inpatient ward, 8-storey building. In 2020, a new hospital building was put into operation adjacent to Building A.

Rigshospitalet Glostrup was at first known as Glostrup Hospital but later in 2015, the hospital merged with Rigshospitalet Blegdamsvej. Rigshospitalet Glostrup has 512 beds and is one of the largest specialised hospitals in Eastern Denmark. The hospital was built in 1952 and opened for service in 1958, thus the original first building is still in use. At present, the Rigshospitalet Glostrup is undergoing expansion and reorganisation due to the high demand for medical treatments among Danish citizens. The hospital consists of three buildings with one large medical building divided into two wings. The front is a 5-storey building and the tower at the back is a 9-storey building (<https://www.rigshospitalet.dk/om-hospitalet/organisation/historie/Documents/Jubil%C3%A6umsbog-GlostrupHospital.pdf>). See figure 3-23 and 3-24 for map of Rigshospitalet available at <https://www.rigshospitalet.dk/english/about-us/Pages/location-maps.aspx>.



Figures 3-19 and 3-20: Rigshospitalet Blegdamsvej building and Rigshospitalet Glostrup building

Figure 3-21 and 3-22: Waiting areas of Rigshospitalet (photos taken by Supuck Prugsiganont)



Data was collected through walk-through observations, and the evaluation criteria were based on a combination of three evaluation guidelines, which were Clinic Design Post Occupancy Evaluation (The Center for Health Design, 2015), evaluation guidelines for healthcare facilities (Van der Voordt & Van Wegen, 2005) and Rigshospitalet's waiting areas assessment guideline. Aspects of the combined guideline are presented in Paper 5. I filled in the evaluation sheets, made a rough drawing of the room or areas and photographed the physical conditions of the areas. Evaluation criteria are described in tables 3-5 and 3-6, but details are described in Chapter 2 (Literature Review). The evaluation guidelines were used to evaluate both Rigshospitalet and Maharaj Chiang Mai hospital. Appendix 8 show an example of the waiting area registering sheet and drawings of the waiting areas.

Aspects	
1. Reachability	5. Safety
2. Accessibility	6. Spatial orientation
3. Efficiency	7. Privacy
4. Flexibility	8. Health and well-being

Table 3-6: Waiting area registering criteria of Rigshospitalet

Aspects
1. Information to support patient navigation and way-finding
2. Facilities (water dispenser, coffee, tea, TV, art)
3. Hygiene (waste containers, smell)
4. Accessibility for all patient profiles
5. Furniture (seating, table, reception)
6. Light/daylight (ceiling light, zone light, daylight)
7. Restroom proximity

**** Remark** - please refer to Appendix 8 for examples of both Rigshospitalet Blegdamsvej and Glostrup registering/evaluation sheets and an example of the sketches at Rigshospitalet Blegdamsvej waiting area **

Step 3.2.3 Involvement in waiting areas renovation project: After having completed registering the physical conditions of 42 waiting areas at Rigshospitalet, the head of the hospital planning team informed me that a renovation budget had been allocated to renovate 8 critical areas (areas that were in urgent need of renovation). She asked me if I would be interested in joining the design team, and I agreed. The collaboration was a three-month design project held between August and October 2018. I helped with the design of all the eight waiting areas. However, I only conducted thorough observations of two specific areas (Ultrasound clinic and Nephrology clinic), where I participated in design brief meetings and conducted interviews with nurses involved in the renovation project (see Paper 3, which has the head of the hospital planning team as co-author). I selected only two specific clinics because of these were the only two clinic that granted me ethical permission to interview clinical nurses and patients. Nonetheless, only the Ultrasound clinic allowed me to participate in their design brief meetings because they were willing to hold meetings in English (usually meetings will be held in Danish), but both clinics gave me permission to interview their clinical nurses.

This study was conducted to answer the research questions mentioned in Paper 3 regarding (1) the involvement of clinical nurses and their influence on the design of waiting areas in a Danish public hospital and (2) how the specific design guideline 'the Design Manual' can be implemented in the design process across disciplines. During the collaboration project, the design team provided me with a specific design guideline called 'the Design Manual', which I used as the main guideline for redesigning all the eight areas. Part of the aim of data collection was to test the usability and efficiency of the Design Manual when given to the nurses, and provide a basis for considering whether those ideas can be implemented into creating a waiting area design guideline for Thai public hospitals.

Data was collected through three steps; (1) walk-through observations evaluating the Ultrasound clinic and Nephrology clinic, (2) meetings between a researcher, a hospital architect and nurses and (3) interviews with clinical nurses (see Paper 3).

- **Walk-through observations of Ultrasound and Nephrology clinics:** The processes are already described in Section 3.2.2.
- **Meeting between researchers, hospital architect and nurses:** Before the meeting, the Design Manual and conclusion of waiting areas evaluation were emailed to the nurses involved in the renovation project. The Design Manual is a specific design guideline created by Rigshospitalet's design team focusing on the design of hospital waiting areas. The manual consists of eight chapters, where Chapters 6, 7 and 8 focus on patient profiles, patient zones and waiting room types. Details of the Design Manual are provided in Chapter 3 (Literature review). Two meetings (60 minutes each) took place in the Ultrasound clinic in September and November 2018. Four nurses participated in the meeting, including a head nurse and three registered clinical nurses. The hospital architect and I set up the meeting, and the agendas focused on (1) number and type of seats, (2) specific waiting areas/zones and (3) other topics related to the design of waiting areas. Six people attended both meetings (four clinical nurses including a head nurse, the hospital architect and myself). Both meetings began with the architect explaining the overall ideas of the schematic design and later nurses commented on the architectural plan and *what* they would like to add in order to amend the design. However, the nurses should base their ideas of furniture, room types, colour scheme and details of waiting area only on Chapters 6, 7 and 8 of the Design Manual. Each point in the agenda was discussed. The architect and I took notes and summarised the comments before completing the meetings. The meeting processes and the design manual have already been described in Paper 3.



Figures 3-25 and 3-26: Design brief meetings between clinical nurses and architect, where I participated (photos taken by Supuck Prugsiganont)

- **Interview with clinical nurses:** After the design brief meeting, I contacted the nurses who participated in the design brief meetings to arrange interviews with them. Semi-structured interviews were conducted with six nurses; two nurses from the Ultrasound clinic and four nurses from the Nephrology clinic. The interviews took place in November 2018 and February 2019. The interview questions were developed from literature reviews, content review of the Design Manual and data analysis conducted in Part 1. The duration of the interviews was 15 to 60 minutes

and took place in the Ultrasound and Nephrology clinics. I emailed the questions to the nurses for them to review in advance. The interview questions pertained to their perspectives regarding hospital waiting areas: (1) definition of the areas (their expectation of the waiting area and aspect(s) ignored by hospital planner), (2) user-focused concept (definition of the term, how important is the term, supporting facilities for user-focused concept) and (3) their perspective regarding the Design Manual and what can be amended.

Step 3.3 Registering the physical conditions of waiting areas in Maharaj Chiang Mai

hospital: Analysis data from Part 1 was not sufficient to analyse the validity of the findings and answer research questions regarding space management problems in Thai public hospitals. Moreover, I had received critical comments from journal reviewers about the data presented in Paper 1; the reviewers wanted to see precise data from the main case study (Maharaj Chiang Mai hospital) (Yin, 2014; Saunders et al., 2019). Therefore, in November 2018, I went back to Maharaj Chiang Mai hospital to conduct a three-week walk-through observation and evaluation of 32 waiting areas. I employed the same evaluation criteria that I used to evaluate waiting areas at Rigshospitalet (The Center for Health Design, 2015; Van der Voordt & Van Wegen, 2005; Rigshospitalet's waiting area registration guidelines). Data was collected through evaluation sheets and photographs. Data was presented in Paper 1 and partly in Paper 5.

Step 3.4 Data analysis: Data analysis was divided into two parts. The first part was the analysis of the walk-through observations, where I used a combination of criteria from three evaluation guidelines that I employed for data collection. The criteria were used to analyse the current conditions of Rigshospitalet and Maharaj Chiang Mai hospital waiting areas. The evaluation results and findings of Rigshospitalet were presented in Papers 3 and 5, whereas the findings from the evaluation of Maharaj Chiang Mai hospital were presented in Papers 1 and 5. Notes from the meetings were analysed and were added to amend the schematic design of the Ultrasound ward waiting areas, which were presented in Paper 3. The second part was the analysis of the interviews from the six nurses. Thematic analysis was used to analyse the interviews (Creswell, 2013; Strauss & Corbin, 1998), where the audio recordings of the interviews with the six nurses were transcribed verbatim and read line by line to understand the nurses' opinions regarding 1) user-focused approach, (2) the concept of the waiting areas, (3) what should be considered for the design brief and (4) the concept of design brief. Open coding was then applied to conclude the themes that emerged during the interviews (Creswell, 2013). Data from the interviews with nurses was used in Papers 3 and 5.

Step 3.5 Limitation of the methods employed in the waiting area evaluation of

Rigshospitalet and Maharaj Chiang Mai hospital: As for the nature of qualitative methods, there are limitations of both walk-through observations and interviews. With regard to walk-through observations, although clear criteria for waiting area evaluation were established and more accurate data than Part 1 were presented, the evaluation data only scratched the surface of the space management problem. From the analysis of the findings of Part 2, it appears to me that problems in hospital space management and waiting areas are like an 'iceberg'. What I had observed were only the tip of an iceberg, where the root problems and issues that underlie problems are underneath the surface.

A limitation of the interviews is the number of participants, as only six nurses participated. Even though the findings from the interviews provided insights, the emerging themes were not strong enough to generalise the data of Danish nurses (Leung, 2015) due to limited number of participants. Findings can only represent small groups of nurses at Rigshospitalet. However, the findings can be used as a foundation to develop critical questions regarding the involvement of nurses in the design process.

3.3.4 PART 3:

Part 3 consists of the interviews with the patients and medical staff of the main case studies. The interviews were conducted sequentially after I completed Step 3.3 of Part 2 (Registering physical conditions of waiting areas in Maharaj Chiang Mai hospital). The findings of Parts 1 and 2 led to designing the data collection in Part 3, which is the last part of this study. According to my ontological and epistemological assumptions, my curiosity stemmed from wanting to explore individual life experiences that people share while using public hospitals (Creswell et al., 2016). My queries developed, leading to my research paradigm (Saunders et al., 2019). Thus, Parts 1 and 2 provided me useful information about the characteristics of non-clinical areas and waiting areas in public hospitals. They were not sufficient and profound enough to represent individual experiences with regard to hospital waiting areas. As mentioned in Section 3.5 (Limitation of the methods employed in the waiting area evaluation of Rigshospitalet and Chiang Mai hospital), the interviews with nurses provided me with insights regarding their perspectives, but due to limited number of participants, the data was not enough to make a generalisation. The interviews with the six nurses served as a pre-study of Part 3. Therefore, the purpose of Part 3 was to obtain more information from hospital users' experiences and their perspectives regarding waiting areas.

I divided the study into two steps: interviews with patients from Maharaj Chiang Mai hospital and Rigshospitalet, presented in Papers 4 and 5, and interviews with the medical staff from Thailand and Denmark, presented in Paper 5. The interviews with patients provided me with some insights from patients' perspectives, while interviews with the medical staff provided me data to compare what the differences and similarities of experiences from two groups of hospital main users are.

Step 4. Interviews

Step 4.1 Interviews with Thai and Danish patients: The interviews were conducted to explore patients' experiences and what they share with regard to the use of hospital waiting areas (Van Manen, 1990; Creswell et al., 2016). The aim of patient interviews was to first obtain a better understanding of patient waiting experience during their medical journey. Second, the interviews helped comprehend patient perspectives as to whether different hospital contexts affect their experience. Third, the interview responses help answer the research question framed for this study: How can patients' experience of their care journey influence the design of waiting areas of Thai and Danish public hospitals? Finally, the responses help explore whether culture has an impact on patients' care journey and experiences regarding waiting areas.

Step 4.1.1 Ethical permission: As described in Section 3.1, one of my struggles was to obtain ethical permissions as my first intention was to interview patients from four hospitals in Thailand, Denmark and Norway. I applied for ethical permission at three countries, but Maharaj Chiang Mai and Chulalongkorn hospitals had different regulations for ethical considerations. I submitted documents for ethical permission at Chulalongkorn hospital in November 2017. For Maharaj Chiang Mai hospital and Rigshospitalet, I submitted permission in August 2018. For St Olavs hospital, the permission was submitted in October 2018.

For Thailand, I began with applying for ethical permission from Chulalongkorn hospital. The process was highly bureaucratic, requiring 19 different types of documents to be submitted. It was nerve-wracking rather than time consuming. After submitting all the required documents, the hospital did not grant me permission. The hospital ethical committee required the entire research team including my supervisors to enrol for the ethical considerations for clinical trials course. I refused to enrol for the course as it is irrelevant to my research topic; I then excluded the hospital from the interviews. For Maharaj Chiang Mai hospital, the ethical permission was submitted through the board of committee of the hospital along with the research proposal and interview questions. After the permission was granted, I contacted the director of nursing department about the interviews with patients and the medical staff. The nursing department director informed the head nurse of each ward, which included the Oncology, Nephrology and Ultrasound clinics. The chosen clinics represented clinics with chronically ill patients. Moreover, the clinics I chose also aligned with the clinics that I interviewed nurses at Rigshospitalet (Yin, 2014). The nurses then contacted patients to schedule the interviews.

For Denmark, I contacted the head nurses directly for permission as Danish Ethical Permission only applies for research involving clinical trials. I did not receive permission from the Oncology clinic. However, one patient that I interviewed knew another patient from the oncology department (Saunders et al., 2019; Bryman et al., 2015). I contacted the patient from the oncology department directly for the interview. However, I followed the ethical permissions guideline. For Norway, I applied for permission through the Regional Committee for Medical and Health Research Ethics website. After permission was granted, I contacted the head of St Olavs hospital clinics where my request was passed on to head nurses of the Nephrology, Ultrasound and Oncology clinics. However, difficulties with recruiting sufficient participants (patients and medical staff) led to a low number of participants (two patients and two nurses). Therefore, I did not analyse interviews from patients and staff of St Olavs hospital. The ethical permissions from Thailand and Denmark are presented in Papers 4 and 5.

Step 4.1.2 Context: As described in Papers 4 and 5, the interviews were conducted in two hospitals: Maharaj Chiang Mai hospital and Rigshospitalet. Interviews took place in hospital waiting areas of the Ultrasound clinic, Nephrology clinic, kidney treatment, Oncology clinic, or any place that patients preferred (hospital café, parks, clinics during treatment). Three interviews were telephone interviews.

Step 4.1.3 Participants: Due to ethical permission rules, recruitment was limited to participants who were older than 18 and who had been to Maharaj Chiang Mai hospital or Rigshospitalet between 2018 and 2019, partly in response to limitations associated with time and resources (ethical permissions). I had difficulties reaching the expected participant number as some of the patients refused to give interviews when the appointments were arranged. Participants comprised of 21 patients, where 12 were patients from Maharaj Chiang Mai hospital and 9 were patients from Rigshospitalet. Table 3-7 provides a list of patients (made anonymous) with duration of the interviews. Ages varied from 25 to 70 years old. One patient from Rigshospitalet had been a patient of a Thai public hospital, but not Maharaj Chiang Mai hospital.

Table 3-7: Interview with Thai and Danish patients

Hospital	Patient/Gender	Duration (min)	Technique
Maharaj Chiang Mai hospital			
	T1/F	18.05	Face-to-face
	T2/M	30.57	Face-to-face
	T3/F	29.15	Face-to-face
	T4/F	30.21	Face-to-face
	T5/M	37.36	Face-to-face
	T6/F	33.34	Face-to-face
	T7/F	42.04	Phone
	T8/M	16.32	Face-to-face
	T9/F	34.21	Face-to-face
	T10/M	37.14	Face-to-face
	T11/F	42.02	Face-to-face
	T12/F	15.57	Phone
Rigshospitalet			
	D1/F	91.54	Face-to-face
	D2/F	41.25	Face-to-face
	D3/M	61.04	Face-to-face
	D4/F	34.41	Face-to-face
	D5/F	38.34	Face-to-face
	D6/F	15.19	Face-to-face
	D7/M	58.19	Face-to-face
	D8/M	30.02	Face-to-face
	D9/F	40.18	Phone

Step 4.1.4 Data collection: Semi-structured interviews were conducted. The interviews with Thai patients took place in December 2018 and the interviews with Danish patients took place between November 2018 and June 2019. I sent out information about the research and interview questions to head nurses after they had accepted my request and scheduled meetings with patients. Some of the patients were introduced to me through other patients, and I contacted them directly. The interviews were conducted face-to-face or via phone. Patients were guaranteed confidentiality and were informed that they could withdraw anytime without giving an explanation and without consequences. Interviews were audiotaped, and Papers 4 and 5 provide details of data collection.

Step 4.1.5 Data analysis: As described in Papers 4 and 5, data was analysed in six steps, where I employed thematic analysis close to the phenomenological approach (An  ker et al., 2019; Erlingsson & Brysiewicz, 2017; Patterson, Sanders, Sommerich, Laver, & Evan, 2017). I transcribed audio records verbatim with the help of two research assistants. Later, I re-listened to the audios several times and defined units of meaning from the transcripts. I coded the units of meaning based on literature reviews and previous data analysis (Part 1 and Part 2), where I formulated categories and emerging themes (Strauss et al., 1998; Braun & Clark, 2006; An  ker, Von Koch, Heylighen, & Elf, 2019; Erlingsson & Brysiewicz, 2017; Wrapson, Patterson, Nakarada-Kordic, & Reay, 2017). However, I focused on key phrases that indicated patient experience and journey comparing Thai and Danish patient care journey and their experiences. The co-author and I then discussed the categories and

themes for validation. Table 3-8 shows examples of Units of Meaning, Codes, Categories and Themes.

Table 3-8: Examples of unit of meaning, codes, categories and themes

Patient	Unit of Meaning	Codes	Categories	Theme
Thai	<i>At this hospital, there is a long waiting time, of course it is because everyone wants to come here, but you don't have enough staff for this high number of patients</i>	Long waiting time High number of patients High demand of patients High demand for medical treatments Lack of healthcare distribution and resources	<i>Healthcare system Lack of resources High demand for treatments</i>	Structure and organisation of Thai healthcare system
	<i>Good waiting area should be hygienic, enough room, zoning, access to natural light, and also not share areas with too many clinics</i>	Patient experience suggestion on requirement of waiting area-hygienic, enough room, light, zoning	<i>Patient experience Hospital standard requirements for waiting area</i>	Physical requirement for hospital waiting area from patient experience and journey
Danish	<i>Positive thing about Danish healthcare is that they try to be informative as much as possible. It means that they try to think from a patient's perspective as much as possible. If you look at dialysis in Denmark in general, they usually say 'what can we do for this person to live a normal life as much as possible'</i>	Patient experience regarding the Danish healthcare system Patient is considered as the centre of treatments and services	<i>Healthcare system Patient-centred and patient-involved approach</i>	Structure and organisation of Danish healthcare system Hospital management system

Step 4.2 Interview with Thai and Danish medical staff: Interviews with the medical staff were conducted parallel to the interview with patients due to time constraints. As presented in Paper 5, the aim of the study was to explore and compare medical staff/patients' experiences between Thailand and Denmark (Creswell, 2016) and answer the research question - What are the differences and similarities between patient and staff experience, opinion and need regarding the use of waiting areas in public hospitals? As the steps in this study were similar to the interviews with patients (Section 4.1), to avoid repetition, some information already described in Paper 5 will be briefly mentioned.

Step 4.2.1 Context: Interviews were conducted in both Maharaj Chiang Mai hospital and Rigshospitalet. For Maharaj Chiang Mai hospital, interviews only took place in the clinic and for Rigshospitalet, interviews took place in the clinics and also in medical staff offices.

Step 4.2.2 Participants: When I contacted head nurses of the Ultrasound, Nephrology and Oncology clinics for interviews with patients, I also requested for permission to interview

nurses and doctors. For data alignment, I interviewed doctors and nurses who worked in these specific clinics (Yin, 2014). Recruitment was limited to doctors and nurses who had been working in the hospital for at least one year due to the study time constraints. The interviews comprised four doctors and five nurses from Maharaj Chiang Mai hospital and two doctors and six nurses from Rigshospitalet. Table 3-9 lists details of medical staff interviews.

Table 3-9: Interview with Thai and Danish medical staff (made anonymous)

Hospital	Medical staff/gender	Duration	Technique
Maharaj Chiang Mai hospital			
	Doctor S/F	34.34	Phone
	Doctor U/M	35.08	Skype
	Doctor K/M	44.07	Skype
	Doctor C/M	84.26	Phone
	Nurse U/F	46.50	Face-to-face
	Nurse T/F	51.23	Face-to-face
	Nurse S/M	38.21	Face-to-face
	Nurse K/F	53.29	Face-to-face
	Nurse ST/F	21.18	Face-to-face
Rigshospitalet			
	Doctor J/M	61.06	Face-to-face
	Doctor B/M	44.14	Face-to-face
	Nurse S/F	21.12	Face-to-face
	Nurse I/F	42.12	Face-to-face
	Nurse A/F	19.48	Face-to-face
	Nurse L/F	28.31	Face-to-face
	Nurse G/F	15.55	Face-to-face
	Nurse K/F	16.30	Face-to-face

Step 4.2.2 Data collection: The interviews were conducted for a duration of 10 months between November 2018 and August 2019. As described in Paper 5, the interviews were audio recorded and transcribed verbatim.

Step 4.2.3 Data analysis: Data analysis was done in six steps, which is presented in Paper 5. However, I emphasised a comparison between patients and staff experiences and opinions, and differences and similarities, and what information can be shared between the two hospitals. As mentioned in Section 2.1.4 (Comparative analysis of pilot case study) one of the research questions regarding how the hospitals learn from each other was not answered in the study of Part 1. However, the question was answered in Part 3 when I conducted interviews with patients and staff due to valuable insights obtained from the interviews.

3.3.5 Limitations of interviews: This study has a number of limitations, which are common to qualitative studies. First, the sampling in this was small for patients (n=21) and medical staff (n=17), so participants may not be representative of all Thai and Danish patients and medical staff from public hospitals. Data from this study only represents the perspective and experiences of patients and medical staff from Maharaj Chiang Mai hospital and Rigshospitalet. Although findings based on the data were sufficient to identify and prioritise

factors that influence patients and medical staff experiences and perspectives, data was insufficient to draw a clear relationship between cause and effect between each factor and underlying issue. Second, participants in this study were identified as willing to participate due to ethical permissions (both patients and medical staff), this could create the potential for selection bias (Keil & Edwards, 2019). Third, the interviews were conducted in Thai language for Thai participants and in English for Danish participants. Interviews conducted in Thai were translated to English, which could lead to potential information loss. However, translated quotes were verified by translators for accuracy. Due to the fact that interviews with Danish patients can only be carried out in English, this excluded patients who cannot speak English since with language barriers some participants might not be able fully to express their feelings. Lastly, Thailand and Denmark have a large gap in their economic and social contexts. However, the last limitation can lead to further study, where a comparison between countries with a more similar cultural context and healthcare competency can be considered.

3.4 UNPUBLISHED INTERVIEWS

When I began Part 3, a critical question was raised regarding problems and knowledge about hospital design processes. Without being aware of time constraint, I carried out interviews with 16 experts, which includes hospital policy makers, hospital planners and facilities managers in three different countries - Thailand, Denmark and Norway. Half of the interviews were transcribed but are not included in any paper. As mentioned in Section 4.1.1 (Ethical permission), I also interviewed two patients and two staff members from St Olavs hospital, but the interviews were never transcribed or included in any of the studies due to the limited number of participants. Table 3-10 lists the details of the unused interviews. This data is valuable, and provides me the opportunity to conduct further studies regarding problem and knowledge exchange in the hospital design process.

Table 3-10: Unpublished interviews carried out during study Part 3

No	Interview	Roles	Duration (mins)	Technique
Thailand				
1	Medical doctor	Policy maker, Maharaj Chiang Mai hospital	57.06	Face-to-face
2	Medical doctor	Policy maker, Maharaj Chiang Mai hospital	20.06	Face-to-face
3	Civil engineer	Hospital planner	30.58	Face-to-face
4	Civil engineer	Hospital facilities management	60.04	Face-to-face
5	Architect	Hospital planner	60.05	Skype
6	Civil engineer	Hospital facilities management	84.19	Phone
7	Architect	Hospital planner	52.48	Phone
Denmark				
8	Engineer	Director service centre, Rigshospitalet	36.56	Face-to-face
9	Engineer	Project manager, Rigshospitalet	44.25	Face-to-face
10	Engineer	Head of hospital planning team	47.19	Face-to-face
11	Architect	Hospital planner	48.50	Face-to-face
12	Architect	Hospital planner - the Capital Region	50.44	Face-to-face
13	Architect	Hospital planner - the Capital Region	64.16	Face-to-face
Norway				
14	Senior advisor	Manager, advisory and planning department, Sykehusbygg	55.28	Face-to-face
15	Architect	Hospital planner, Sykehusbygg	37.56	Face-to-face
16	Medical doctor	Senior consultant/hospital planner, Sykehusbygg	51.35	Face-to-face
17	Patient A	Dialysis, St Olavs hospital	29.06	Face-to-face
18	Patient B	Dialysis, St Olavs hospital	35.01	Face-to-face
19	Nurse A	Dialysis, St Olavs hospital	52.30	Face-to-face
20	Nurse B	Dialysis, St Olavs hospital	17.22	Face-to-face

*Remark: Patients and nurses have been made anonymous

3.5 VALIDATION RELIABILITY AND GENERALISATION

3.5.1 Validity: In the field of qualitative research, validity implies trustworthiness and appropriateness (Leung, 2015). The validity of a research study includes two domains, internal and external validity (Patino & Ferreira, 2018).

Internal validity and external validity can be confirmed by several techniques, which includes triangulation, prolonged engagement, member check, saturation, reflexivity and peer review (Leung, 2015).

- **Triangulation** - As mentioned in Section 2.2.3, I applied triangulation of methods for data collection and data validity (Bryman et al., 2016; Health, 2015; Yin, 2014). Data was collected through the 3-part data collection, which includes literature review, building evaluation, involvement in hospital design project and interviews. Each technique provides an outcome with shared similarity; however, they were different in data depth and robustness, which creates trustworthiness of outcomes. In Papers 3, 4 and 5, data analysis was a comparison analysis between waiting areas in different public hospitals.
- **Prolonged engagement** - The term refers to spending extended time with respondents in their native culture and everyday world in order to gain a better understanding of behaviour, values and social relationships in a social context (Given, 2008). For Thailand, I consider myself to have a good understanding of Thai context, as I am a citizen. Moreover, I have been involved in data collection at Maharaj Chiang Mai hospital since 2016. For Denmark, I considered my three-year PhD study and an early involvement in Rigshospitalet waiting area project as a long engagement in data collection, which began in 2017.
- **Member check and saturation** - Due to ethical permissions, participants were patients and medical staff that were willing to participate in interviews, therefore it is difficult to set a high bar for participant selection criteria. However, data saturation appeared after four participants (patients and medical staff) were interviewed. Interview transcripts were sent to all participants to review the detailed interview responses and verify the interpretive accuracy and transparency (Carlson, 2010; Harvey, 2014)
- **Reflexivity and peer review** - I used the opportunity of my 3-month external research stay at College of Human Ecology (Department of Design and Environmental Analysis - DEA), Cornell University. I discussed the methodology employed for the study on whether the methods are suitable and cover problem statements in the study. DEA held weekly lab meetings where lab members volunteer to submit their research project or methodology for peer review.

3.5.2 Reliability: reliability in a diverse paradigm of qualitative approach lies with consistency (Leung, 2015) as it is impossible to replicate the process of the same results for qualitative study (Leung, 2015; Golafshani, 2003; Bryman & Bell, 2015). However, in order to increase reliability I applied the combination of data collections (Leung, 2015). In this study, the process of data collection was divided into three parts (see brief research methodology section 3.2). In Part 1 and Part 2, I applied combination of three methods of empirical data collection (1) analytical drawing technique (Van der Zwart et al., 2015; Van der Voordt et al., 1997), (2) health-care facilities assessment (Van der Voordt et al., 2015), and (3) USetool

(walk-through observation). The combination of methods that I employed was later used by another group of researcher from TU Delft and was published in 2019 - Health Environment Research and Design Journal (HERD) (Lacanna et al., 2019). As the methods were adopted by another research group indicates that the methods that I originally employed are reliable and lead to credible outcome.

George and Apter (2004) describe that to increase qualitative reliability the researcher must verify the accuracy of work in terms of form and context with constant comparison either with peers or alone. Webster and Watson (2002) and Nardelli (2016) support this argument and they suggest that having colleagues read and comment on the work can help to achieve maturity through frequent revisions. Therefore, besides combination of methods of data collection, I also applied *audits* approach where I let other researchers check my research approach and analysis throughout the three parts of my data collection (Linclon & Guba, 1985). I mainly based my audit initiatives on participation in academic conferences, where Paper 1 was developed through suggestions I received from an academic conference (Salford - CIB World Congress conference) and was later elaborated into a journal article. Paper 2 was developed through peer review suggestions provided during an architectural conference (SARCH-2018). For paper 3, I used the opportunity of external research stay, where I received comments from colleagues at DEA weekly lab meeting. During our discussions, I improved the methodology and data analysis (mentioned in 3.5.1). Paper 3 also received blind peer-review comments from two participants of ARCH19 conference. List of conferences is provided in appendix 7.

Paper 4 and 5 include findings from data collection in Part 3 - the interviews. I set up a peer review session where we discussed clarity of interview questions, appropriateness, and relationship between interview questions and research questions. After the session, interview questions were revised and used in a pilot study, where I interviewed the first participant. Interview questions were amended for clarity, consistency and answer to research questions, before I carried out the second interview. During data analysis of Part 3, I set up every-two-week meetings with my supervisor in which we discussed consistency of findings to ensure data accuracy. The process of data analysis is presented in Paper 4 and 5.

3.5.3 Generalizability: generalizability is commonly applied in quantitative study as the term refers to the extent to which results can be applied to wider group and circumstances (Golfashani, 2003; Collis & Hussey, 2009). According to Leung (2015) most of qualitative research is meant to study a specific issue or phenomenon in a certain population or ethnic group with specific context. Therefore, it is uncommon to generalize findings from qualitative study. However, with the rising trend of knowledge synthesis from qualitative research due to its vigorous findings, evaluation of generalizability becomes pertinent (Leung, 2015). The approach to assessing generalizability for qualitative study is to adopt criteria that are intertwined with validity: use of systematic sampling, multidimensional theory, comparison, documentation, proper audit, and triangulation.

Yin (2015) defines two approaches of generalizability. First, the *statistical generalizability*, where research findings and conclusion can be applied to larger group of population. Second, *analytical generalization*, where this approach of generalization refers to findings of one study can be generalized to another under similar theoretical framework and proximal

similarity of model. Moreover, analytical generalization can be applicable when one study is similar to another study on the account of time, place, people, and other social context (Eisenhardt, 1989; Flyvbjerg, 2006; Leung, 2015). Therefore, analytical generalization is more relevant for qualitative study and to my study. I evaluated generalizability of my findings by adopting systematic sampling, multidimensional theory, comparison and documentation. Some of the techniques were already applied in validity (3.2.1) and reliability (3.5.2) as the approach of the techniques are intertwined.

- **Systematic sampling** - two systematic sampling selections were employed. First, the selection of case studies. For both primary and secondary case studies, I applied Yin's (2015) case selection criteria where case studies should represent (1) useful information, (2) predict similar results (literal replication), and (3) predict contrasting results for anticipation reasons (theoretical replication). This led to the selection of five cases studies, which included two primary case studies (Maharaj Chiang Mai Hospital and Rigshospitalet) and three secondary case studies (St Olavs hospital, Chulalongkorn hospital, and Khoo Teck Puat hospital). However, ethical considerations played a major role in the development of secondary rather than primary case studies, because further investigation was not able to be conducted due to the restrictions in obtaining ethical permission for some cases.

Second, the selection of participants for user involvement and user focused studies, which included meetings with nurses and interviews with patients and medical staff. I recruited only participants who represent end users of hospital waiting areas (patients and medical staff) as mentioned in section 1.3 research scope and delimitations. Similar to the selection of case studies, ethical permissions played an important role in the recruitment of the interviewees. However, the study was not able to represent space management problems in non-clinical area as well as represent patient/staff perceptions from all the public hospitals in Thailand and Denmark as mentioned in section 4.2.3 (limitation of interviews).

- **Multidimensional theory** - four theoretical approaches (healthcare landscape and context, building evaluation and assessment, new paradigm of hospital design, cultural settings) were applied throughout this study as described in chapter two (literature review). First, the healthcare landscape and context was implemented to have an understanding and overview of healthcare system in primary case studies. Second, building evaluation and assessment approach was employed to frame systematic techniques for data collection. Third, new paradigm of hospital design, where I discussed the concept of terminologies that relate to user involvement and user focused approached. The discussion of this theoretical approach provided me the information for data analysis. Fourth, cultural setting, where I discussed the primary case studies culture and value using Hofstede six cultural dimensional theory (Hofstede, 1997; Hofstede et al., 2010).
- **Comparison** - part of this PhD is a comparative study, which is presented in paper 2, 4, and 5. The purpose of Paper 2 is to compare the similarity and difference of public hospital waiting areas characteristic. Findings led to development of waiting area typology that can be transferred and applied in other public hospital settings

(presented in section 4.2). For both Paper 4 and 5 the purpose was to compare experiences and opinions of patients and medical staff of primary case studies (Thailand and Denmark) towards waiting areas. Identification of commonalities across the two cases that vary in maximum degree are considered highly transferable, because the common parts (similar setting - large public hospitals, similar group of participants) are present in all the cases, despite their variations (Andersen, 2016). Findings from Paper 4 and 5 provided two significant models. The first model presents core components that have impact on patient waiting experience and care journey (figure 5-2). The second model introduces core elements that can optimize patient waiting experience and care journey (figure 5-3). Both models can be implemented in the design of other public hospitals.

- **Documentation** - this study led to concatenate five publications that contain systematic methods of data collection and findings (presented in section 4 findings). Hence, I opined to contribute my study outcomes to the existing knowledge regarding hospital design guidelines that can decrease patient stress level, and knowledge about patient non-clinical areas and waiting area design for public hospitals.

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4. FINDINGS

This PhD thesis is a concatenation of five peer-reviewed papers of which Papers 1, 2 and 3 have been published. Paper 4 has been submitted and is awaiting review comments. The last paper, Paper 5 is just recently submitted. The complete papers can be found in Appendix 1 to 5 where table 1-1 shows an overview of all the papers. Summaries of all papers have been presented consecutively in this chapter, in which each paper represents every step of my data collection throughout this doctoral study (Parts 1, 2 and 3 presented in Chapter 3 - Methodology). Figure 4-1 presents the focus areas of each paper.

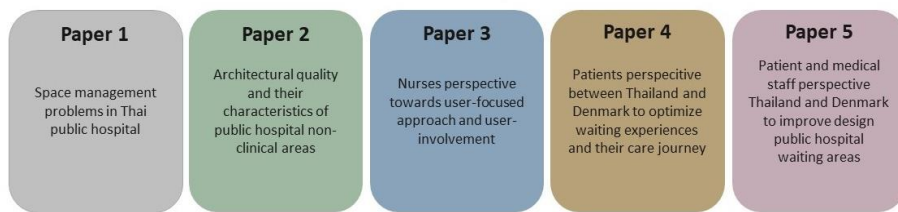


Figure 4-1: Focus of Papers 1 to 5

Paper 1 focused on space management problems in public hospitals in Thailand. A part of the data was collected in 2016 prior to this study. The early version of Paper 1 is a conference procedure paper (see Appendix 6 for a list of other publications). The paper was then developed into a journal article where the aim was to investigate the incremental development of public hospitals in Thailand as well as identify the space management problem in hospital non-clinical areas. Paper 1 furnished me with information regarding the physical environment of non-clinical areas in public hospitals in Thailand, including their current physical condition. Moreover, Paper 1 also provided me an overview of the healthcare system in Thailand.

Paper 2 focused on the architectural quality and characteristics of non-clinical areas in public hospitals, including waiting areas. The aim of this paper was to explore and observe the characteristics of waiting areas to identify the differences and similarities in their architectural characteristics, and observe how the areas are being used by patients and visitors.

Paper 3 focused on a hospital's primary users, shifting from evaluating hospital non-clinical areas. It investigated nurses' perspectives regarding the user-focused design approach and user-involvement in the hospital design process. The paper was a mini study with empirical data collection carried out through interviews with nurses and meetings. The findings from Paper 3 provided me with insights for framing the research questions for Papers 4 and 5.

Paper 4 focused on patient perspectives regarding their care journey and waiting experiences. It compares patient perspectives from two countries - Thailand and Denmark. The aim of this paper was to obtain and compare information regarding patient needs to help improve patient waiting experience. However, the findings presented underlying

issues, besides the physical environment of waiting areas, that impact patient journey and waiting experience. The findings from Paper 4 formed the premise of Paper 5. Finally, Paper 5 analysed and concluded all the collected empirical data that were collected throughout the doctoral study. However, Paper 5 lays emphasis on the comparison of patient and staff data from the two hospitals that were my primary case studies (Maharaj Chiang Mai hospital and Rigshospitalet). The study aimed to compare and identify patient/staff experiences and opinions, where outcomes can be utilised to inform hospital planners and facilities managers of public hospitals. The sections that follow present summaries of Papers 1 to 5.

4.1 PAPER 1: IDENTIFICATION OF SPACE MANAGEMENT PROBLEMS IN PUBLIC HOSPITALS: THE CASE OF MAHARAJ CHIANG MAI HOSPITAL

Prugsiganont, S. and Jensen, P.A. (2019) 'Identification of space management problems in public hospital: The case of Maharaj Chiang Mai hospital'. *Facilities*, 37(7/8), pp.435-454.

The purpose of this paper was to identify space management problems to improve hospital facilities focusing on public hospital non-clinical areas (Figure 4-2). The study focused on gaining a better understanding of the Thai healthcare system and investigating how the services of Thai primary and public healthcare system are organised.

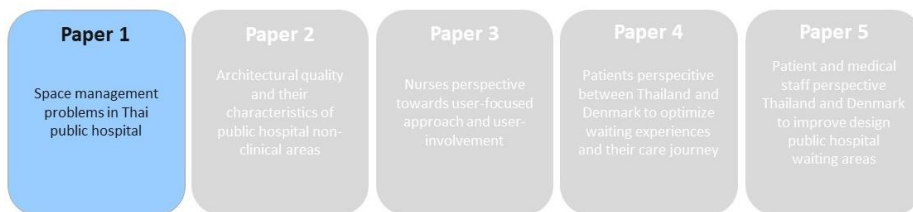


Figure 4-2: Brief purpose of Paper 1

A question that emerged during the observation of Thai healthcare facilities prior to this study was 'why are Thai public hospitals so overcrowded and how have the hospitals been managing their spaces?' The question led to the study conducted in Paper 1. Therefore, my intention behind the investigation of the Thai healthcare system and hospital space management is to find the *link* between the number of patients coming to a hospital and the space management problems in the hospital. The research question framed for this study is 'what space-management problem can be identified in Maharaj Chiang Mai hospital's management with regard to the functional quality of non-clinical areas?'

Maharaj Chiang Mai hospital was selected as a case study for this paper for two major reasons: the hospital represents a large government teaching hospital and the hospital has experienced tremendous expansion and development throughout the 1970 to 2016. The hospital was built in 1975, and since then it has expanded from 2,325 to 200,000 square meters. The study was carried out in two parts: a literature review of the Thai healthcare system and evaluation of hospital non-clinical areas. With regard to the literature review, I applied the Clinic Design for POE (The Center for Health Design, 2015) along with a functional evaluation of healthcare facilities (Van Der Voordt et al., 2005). I carried out walk-through observations imitating patients and walking through various hospital non-clinical facilities (Preiser, 1988, 1995, 2003; Blakstad, 2008; Hansen et al., 2011; The Center for Health Design, 2015; Fronczek-Munter, 2016). Six walk-through observation routes were conducted. Refer to Section 3.3.1 (data collected prior to this study) for details of the walk-through observations.

The findings were divided into two parts. The paper first presents the results from literature review and then presents the results of the empirical study. The findings are listed as follows:

- **Review of the general context of the Thai healthcare landscape** – As the literature on the Thai healthcare landscape indicates, increased patient inflow has a major impact on the architectural layout and space management of Thai government hospitals. The three main factors leading to increased patient inflow are:
 - *Lack of local general practitioners and poor primary care services* - The acceptability management of local healthcare centres is poor; all hospitals (from municipal to national/large) provide primary care services. Therefore, patients can directly visit large hospitals for primary healthcare services (Guinea et al., 2015; Pongpirul et al., 2009; Prakongsai et al., 2009; Satayavongtip et al., 2016). Moreover, the Thai Ministry of Public Health has not framed strict regulations that obligate citizens to seek treatments at local healthcare centres (The Kingdom of Thailand Health System Review, 2015).

Furthermore, the people strongly believe that tertiary referral hospitals (large public hospitals) can perform better treatments than local community hospitals (Srivanichakorn & Van Dormael, 1998). According to Singh and Lillrank (2018), local healthcare centres and general practitioners are first approached before a patient reaches any hospital. The high influx of patients in large public hospitals is the result of a combination of lack of systematic distribution of local healthcare services and poor primary care services.
 - *Limited number of government hospitals* - Major hospitals are usually situated in cities. According to the Thai Statistical Bureau (2019) the ratio between the number of hospitals and patients is 1:320,000 from a total population of 65.9 million and a total number of 202 Thai public hospitals. However, 78 hospitals (1/3 of the total number) are located in central Thailand.
 - *The implementation of Thailand's universal coverage scheme* - The universal coverage scheme was introduced in 2002 and has had a direct impact on healthcare access for the citizens. The scheme has given citizens access to healthcare services and changed their health-seeking behaviour (Paek et al., 2016). Moreover, the scheme has also had an impact on hospital services: first, it has affected accessibility, which pertains to long queues and hospital clinics that are overloaded with patients. Second, high acceptability rate, which affects hospital services resulting in, for example, low-quality services and dissatisfaction (Limwattananon et al., 2011; Damrongplasit et al., 2009; Limwattananon et al., 2012; Paek et al., 2016).
- **Findings from empirical studies at Maharaj Chiang Mai hospital**
 - *Current state of Maharaj Chiang Mai hospital* - According to records of the hospital (Maharaj Chiang Mai Hospital, 2018), its facilities have been developed and remodelled several times to adjust to the present state of

medical functions, services and the number of patients. Long-term development plans for the hospital illustrate the 'incrementalism space adaptation strategy' (Jensen, 2006; O'Mara, 1999). The hospital developed an incremental space strategy as a 'quick-fix or ad-hoc' for the use of space. A major reason for this quick-fix expansion is the high influx of patients. In 2017, there were approximately 1.3 million patients in outpatient clinics and 48,000 in inpatient clinics (Maharaj Chiang Mai hospital, 2018).

- *Findings from a functional assessment of the Maharaj Chiang Mai hospital* - To avoid repetition from Paper 1, only brief findings are presented in table 4-1, which illustrates eight criteria of healthcare facilities evaluation (The Center for Health Design, 2015; Van der Voordt et al., 2005).

Table 4-1: Common problems of functional quality in non-clinical areas of Maharaj Chiang Mai hospital

Topic	Common problems
Reachability	<ul style="list-style-type: none"> • Long walking distance from parking building to clinics • Patients have to walk for more than 15 minutes from parking to clinic
Accessibility	<ul style="list-style-type: none"> • Crossing circulation as visitors and patients have to walk past the clinics to reach the waiting areas • Corridors are used to park wheelchairs and beds or store medical supplies
Efficiency	<ul style="list-style-type: none"> • No clear identification of method wards and public routes • Lack of maps providing the location of wards or clinics
Flexibility	<ul style="list-style-type: none"> • Areas are difficult to adapt or modify because the relocation of wards must correlate to the location of medical wards between old and new buildings
Safety	<ul style="list-style-type: none"> • Crossing circulation between clinics and public areas
Spatial orientation	<ul style="list-style-type: none"> • No clear sign or information of clinic or facilities location; for example, toilets, restaurants and shops • Distance between each signage (20 to 40 meters) • Overlapping areas as nurse stations are located on patient corridors • Corridors are used as storage spaces
Privacy	<ul style="list-style-type: none"> • Reduced privacy because of crossing circulation and overlapping areas
Health and well-being	<ul style="list-style-type: none"> • Noisy due to crossing circulation between clinic and public zones • Lack of air-conditioning • Lack of opening for cross ventilation

- *Analysis of the walk-through observations* - I applied the functional floor plan analysis (Van Hoogdalem et al., 1985; Van der Voordt et al., 1997; Van der Zwart et al., 2015) and spatial configuration (Van der Zwart, 2014) to analyse hospital architectural floorplans. I mapped colour schemes to hospital functions, for example, building circulation, clinics, waiting areas and supporting facilities. Figures 4-3 shows examples of functional floor

plan analysis in which I indicated parking building and building circulation areas in yellow colour and mapped patient routes to hospital functions (the six routes that I imitated). Simple lines in figure 4-3 represent walk-through routes imitating patient care path (from arrival until departure). The figure is an example of outpatient visit route. Brown and blue circles represent the sequence of the facilities that patients visit. The brown circles represent outpatient walk-in route and the blue circles represent outpatient route with appointment. Figure 4-4 show examples of functional floor plan analysis I applied called spatial configuration analysis. The diagram represented step-by-step of the facilities that patient visits during their care journey (from parking garage, intake, seeing the doctor, pharmacy). Please see figure 3-5 for detail of colour legend of diagram presented in figure 4-4.

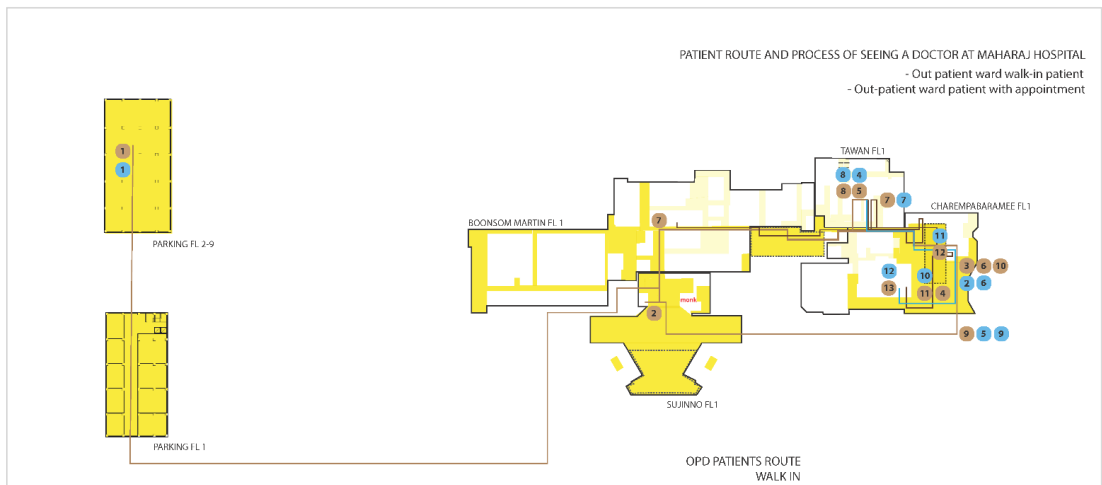


Figure 4-3: Functional floor plan analysis illustrates the use of hospital spaces

The data analysis of walk-through observations of non-clinical areas in Maharaj Chiang Mai hospital combined with the functional floor plan analysis and spatial configuration analysis show two additional factors that may cause a space management problem in large public hospitals.

- Lack of integration of Thai culture in hospital design and architecture* - Based on the findings of walk-through observations, the spatial arrangement of the hospital does not match the behaviour of Thai people. Hofstede (2011) and Riratanaphong et al. (2015) state that Thailand is a collective society where people from birth onwards are integrated into strong, cohesive in-groups which continue to protect them throughout their lifetime in exchange for unquestioning loyalty. During the observations, 1 patient is always accompanied by 3-4 family members. Therefore, there will be patient family members in hospital waiting areas and most of them are for long waits. However, based on these

observations, hospital waiting areas do not provide zones for long waits, where patient's family have comfortable seating.

- Lack of appropriate strategic space planning that fits the Thai healthcare system* - The first medical building in Maharaj Chiang Mai hospital was built in the 70s; within 30 years, the hospital was expanded incrementally, resulting in five more medical buildings. According to walk-through observations and analysis of architectural floor plans, it is obvious that each hospital building has been added in instalments without planning and considering long-term space strategies, which has led to difficult navigation (way-finding) that is time consuming, especially for vulnerable groups (elderly, patients in wheel chairs, mentally unstable patients, etc). According to strategic adaptation methods, long-term planning is mandatory to cover a 30-year planning (O'Mara, 1999; Jensen, 2006). Waroonkul et al. (2016) state that strategic planning and space management of Maharaj Chiang Mai hospital has not been taken seriously due to economic problems and bureaucratic processes.

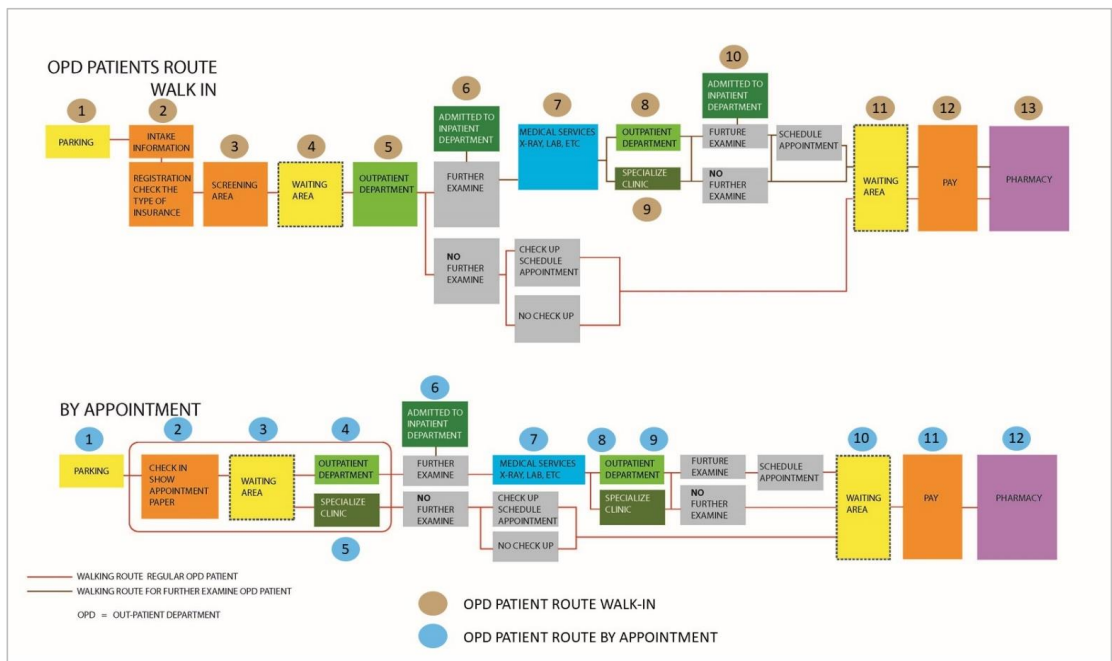


Figure 4-4: Spatial configuration analysis of the Maharaj Chiang Mai hospital imitating outpatient route.

4.2 PAPER 2: HOSPITAL ARCHITECTURE QUALITY - EXPLORATORY OBSERVATION ON THREE CONTINENTS

Fronczek-Munter, A. and Prugsiganont, S. (2018) 'Hospital Architecture Quality - Exploratory observation on three continents', in *Proceeding of S. ARCH 2018* in Venice, Italy, May 2018, pp. 145-160.

The purpose of this paper is to further investigate the physical conditions of non-clinical areas in public hospitals, which was part of the main findings of Paper 1. Therefore, Paper 2 investigated the architectural characteristics of hospital non-clinical areas in three continents which includes Europe (Norway, Denmark, UK), Asia (Thailand, Singapore) and North-America (Canada). The aim of the study in Paper 2 was to explore the similarities and differences in spatial arrangement and the characteristics of non-clinical areas in public hospitals, focusing on waiting areas (Figure 4-5). The research questions framed for the study were: (1) what are the similarities and the differences in the use of non-clinical areas in different hospitals? (2) what can hospitals learn from each other and how can the knowledge of non-clinical hospital design, focusing on patients, be shared between them? Due to my lack of experience, the empirical study did not yield enough data to answer RQ2, only RQ1 was answered. However, RQ2 is answered in Paper 5.

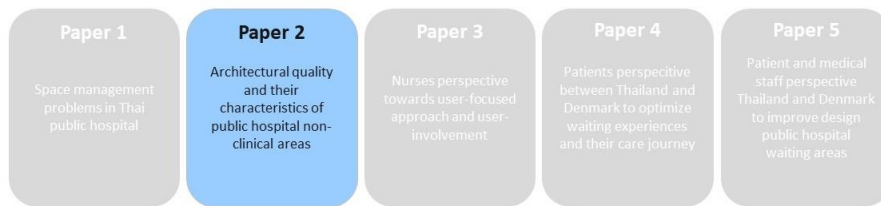


Figure 4-5: Brief purpose of Paper 2




Data was collected through multiple methods and techniques, including USEtool walk-through, reflexive photography, narrative pictorial mapping and semantic schemes. The approach of this study was inductive, where I explored new techniques to select suitable techniques and tools for the next step of my study. Case studies involved eight public hospitals and one healthcare facility, where we seek to reach general conclusions (Yin, 2014). The first author collected empirical data from three public hospitals and one healthcare facility (St Bartholomew's Hospital, London, UK; New QEII Hospital, Welwyn Garden City, UK; Bridgepoint hospital Toronto, Canada; Sudheds centre, Copenhagen, Denmark). Then, the first author and I collected data from five public hospitals (St Olav hospital, Trondheim, Norway; Rigshospitalet, Copenhagen, Denmark; Maharaj Chiang Mai hospital, Thailand; Chulalongkorn hospital, Bangkok, Thailand; Khoo Teck Puat hospital, Singapore).






Empirical data was collected through walk-through observations, where we walked through hospital non-clinical facilities following outpatient care pathways. We then took field notes and photographed the current physical conditions of the areas. The data was analysed based on the usability concept (Fronczek-Munter 2016, 2017) with reflexive photography

(Maben et al., 2015) and narrative pictorial mapping (Lapum, 2009; Lapum et al., 2010). The semantic scheme (Cold, 2002) was used to describe the aesthetic level and spatial arrangement of the waiting areas.

Based on the findings of the exploratory observations of eight public hospitals and one healthcare facility, we developed seven architectural typologies of waiting areas. Seven areas were presented together with the description of the areas based on the walk-through observations. The seven areas are as follows:

Table 4-2: Seven waiting area types found in observations of public hospitals in three continents (all photos were taken by the First author of Paper 2 and me)

Type	Sub-type	Examples from case hospitals
1. Large waiting area	<ul style="list-style-type: none"> Large waiting area like in airports <i>without zoning</i>, where registration, cashier, are in the same zone Area provide large open window with one type of seating or bench 	Maharaj Chiang Mai Rigshospitalet Bartholomew Rigshospitalet Bridgepoint Wells St. Olavs 
	<ul style="list-style-type: none"> Large waiting area <i>providing zones</i> The area provide ceiling to floor windows with access to sunlight and outside view Area provide comfortable seat and choices of seats Area located in building corridor with semi-private atmosphere 	
2. Corridor waiting area with chairs along	<ul style="list-style-type: none"> Waiting area locate in building circulation Area lack of privacy and does not provide zone, high level of noise 	Maharaj Chiang Mai Rigshospitalet Bartholomew Bridgepoint Wells St. Olavs New QEII 
3. Small area aside corridor	<ul style="list-style-type: none"> Area provide semi private atmosphere. For example low ceiling or semi-opaque partition 	Rigshospitalet St. Olavs

<p>4. The space next to window used for waiting</p>	<ul style="list-style-type: none"> • Access to outside view or house lamps • Area usually located in the main entrance to the hospital or in building circulation • Area has access to outside view and nature light 	 <p>Figure 4-9: Rigshospitalet small area aside corridor Maharaj Chiang Mai St. Olavs</p>  <p>Figure 4-10: St Olavs hospital waiting space next to window</p>
<p>5. Hospital outdoor garden</p>	<ul style="list-style-type: none"> • Greenery area of hospital which includes hospital courtyard or garden • Area provide access to patients, visitor, staff, and open for public use 	<p>Khoo Teck Puat St Bartholomew, Bridgepoint Wells St. Olavs Sundhedscenter</p>  <p>Figure 4-11: Khoo Teck Puat hospital courtyard St. Olavs Chulalongkorn</p>
<p>6. Food place and canteen</p>	<ul style="list-style-type: none"> • Large open space with ceiling to floor window and access to daylight and outside view • Used by both patient and family for long waits 	 <p>Figure 4-12: Chulalongkorn outdoor hospital food court Maharaj Chiang Mai</p>
<p>7. Unplanned and information waiting area</p>	<ul style="list-style-type: none"> • Empty areas with shades and view to outside and cross ventilation • The areas are not provided for waiting but, used by patient's family for long wait • The area only found in Thai public hospital 	 <p>Figure 4-13: Maharaj Chiang Mai hospital unplanned area</p>

4.3 PAPER 3: THROUGH THE EYES OF NURSES: USER-FOCUSED DESIGN APPROACH FOR NON-CLINICAL AREAS OF PUBLIC HOSPITALS

Prugsiganont, S., Jensen, P. A., and Poulsen, A.K. (2019) 'Through the eyes of nurses: User-focused design approach for non-clinical areas of public hospitals', in Proceeding of ARCH19 in Trondheim, Norway, June 2019.

Unlike Paper 1 and 2, this paper examined the concept of user-focused design approach through the involvement of clinical nurses (Figure 4-14). Paper 1 provided an overview of the Thai healthcare system and the functional quality of non-clinical areas in Thai public hospitals and Paper 2 established an overview of the characteristics and typologies of public hospital waiting areas. Paper 3 aims at studying the perspective of hospital end users (clinical nurses) and the concept of user-focused design approach.

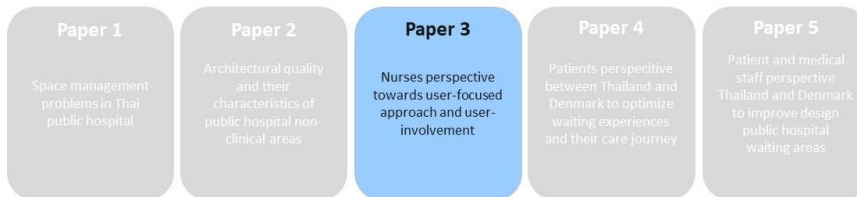





Figure 4-14: Brief purpose of Paper 3

To fulfil this purpose, we first identified the concepts of user-focused and user-involved approach through literature review. Empirical data collection was then carried out. Part of the data presented in Paper 3 was the data I collected during my involvement in the waiting area renovation project at Rigshospitalet. The research question for this study is 'how does the involvement of clinical nurses influence the design of waiting areas in Danish public hospitals and how can the specific design guideline 'the Design Manual' be implemented in the design process?' A combination of the two methodologies was applied in this study; the first part was a document analysis of Rigshospitalet waiting area design guidelines 'the Design Manual'. Empirical data analysis was then conducted through three steps. First, a brief walk-through evaluation of the ultrasound ward was conducted using Rigshospitalet waiting design guidelines. Second, meetings were conducted between clinical nurses, researcher (myself) and the hospital architect (3rd author). Two meetings (60 minutes each) took place in the ultrasound ward in September and November 2018. Six people attended both meetings (four clinical nurses, a hospital designer and myself). After the meeting, the hospital architect and I further developed the design brief based on the meeting discussions. Third, I interviewed six nurses - four from the nephrology clinic and two from the ultrasound clinic.

The findings were divided into three sections based on the steps of data collection as follows:

- **Brief evaluation of the ultrasound ward** - I conducted a walk-through observation (Hansen et al., 2011; The Center for Health Design, 2015; Fronczek-Munter, 2016) at the ultrasound clinic. Table 4-3 illustrates the architectural quality of the clinic.

Table 4-3: Brief evaluation of the ultrasound clinic 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 4-15: Entrance of the ward</p>
2. Accessibility	<ul style="list-style-type: none"> Waiting area is not suitable for wheel-chair bound patients or children and strollers due to limited space 	
2. Efficiency	<ul style="list-style-type: none"> Wide corridor and ease of reach 	 <p>Figure 4-16: 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 lighting 	 <p>Figure 4-17: Patients can lie down on the gurney while waiting, in case of emergency</p>
5. Spatial orientation	<ul style="list-style-type: none"> Waiting area located in the middle of the ward Patients are not exposed to the public while waiting Clear way-finding with signs 	
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 gels, wi-fi, phone chargers, queuing monitors, variety of drinks, furniture for pregnant women and increased privacy required TV is provided for basic hospital information and entertainment 	
8. Architectural feature	<ul style="list-style-type: none"> Waiting area in the middle of the ward Three types of seats: plastic chair with metal legs, beds and wooden benches Gurneys for acute cases More zoning for patients required Patients come in couples (husband and wife) - more seats for couples and pregnant women are required 	

This step provided me with an overview of the physical environment and the current conditions of the ultrasound clinic and what architectural elements required improvement.

- Meetings with nurses** - Before the first meeting, we emailed 'the Design Manual' to the nurses. Three agendas were carried out during both meetings: (1) number and type of seats, (2) specific needs for the waiting areas and (3) other topics related to the design of waiting areas. After both meetings topics were discussed and analysed, four topics were developed as follows:
 - Improved seating:** (1) Replace old seats with new seats from the design manual; nurses selected specific seats from the Design Manual and gave suggestions, (2) increase the number of seats from 40 to 60 (the clinic has 51 seats but only 40 are usually occupied because patients refuse to sit too close to each other) and (3) specific seats with handles are required for pregnant women.
 - Increased patient privacy through the design of seats and partitions:** (1) Replace gurneys with reclining chairs, replace curtains with partitions and add more seats for family members (2) specific couches where individuals or couples can sit with privacy.
 - Improved quality of waiting:** (1) Create zoning with seating for groups, couples, individuals and pregnant women (2) add table lamps to group seating zones, (3) add handwashing station near the water dispenser and (4) add a writing table at the entrance.
 - The use of the Design Manual:** After the nurses had briefly gone through the Design Manual, we discussed the benefits and drawbacks of the

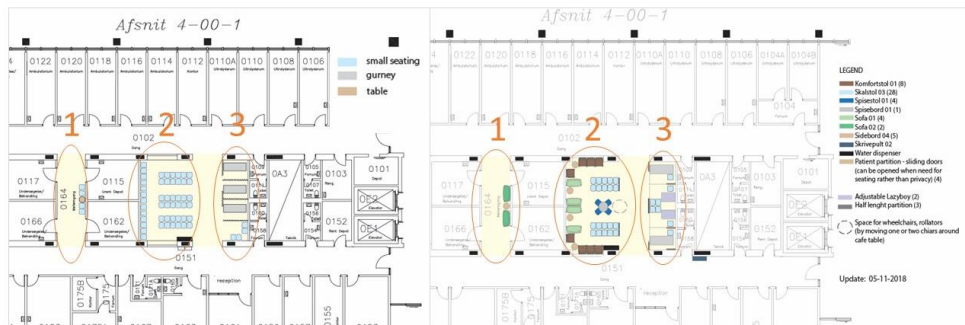
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Figure 4-18: Patient profile and list of furniture available in the Design Manual

The meeting with the nurses provided specific information that was overlooked by both the hospital designer and me, this includes the information I missed during the walk-through evaluation of the area. Clinical nurses who work closely with patients can provide in depth insights that include the exact number of patients who visit the clinic each day, specific patient profiles, requirement for furniture and ideas for separate waiting zones. The Design Manual helped accelerate the design process and avoid unnecessary meetings. Figures 4-19 and 4-20 illustrate the waiting area at the ultrasound clinic before and after the design intervention and collaboration between nurses and the architect using the Design Manual.

The old waiting area provided 51 seats (Figure 4-19), and after the meetings involving the nurses in the design process, we delivered a new architectural layout (Figure 4-20). We provided three zones with a variety of seats including couches and armchairs. In Zone 1, small seats were replaced with couches for patients for long waits. In Zone 2, armchairs and couches were provided for pregnant ladies and whoever accompanies them. Round tables were installed in the middle of the waiting area with room for wheelchair bound patients. In Zone 3, two reclining chairs that can be adjusted as normal seats were provided with adjustable couches.

The total seating number of the new area is 56, and patients have more seating choices as they can choose to sit in areas with more privacy.



Figures 4-19 (left): Plan of the ultrasound ward waiting areas before design intervention

Figure 4-20 (right): Plan of the ultrasound ward after the design intervention, where numbers 1, 2 and 3 represent Zones 1, 2 and 3.

- **Interview with nurses** - I interviewed six nurses, where two were involved in the meetings; however, all six nurses had looked through the Design Manual before the interview. Four themes emerged from the interview with nurses which provide insights into the user-focused approach, nurse involvement in the design process and an overview of the Design Manual, as follows:
 - **Definition of user-focused approach and patient's needs:**
 - Involving patients with medical processes
 - Creating mutual design guidelines that align with patient and staff needs
 - Understanding individual patients and their circumstances and life situations
 - **Concept of user-focused design of waiting areas:**
 - Provide optimal physical comfort for patients, including privacy
 - Provide hospital hygienic standard
 - Provide useful information, such as waiting time
 - **Important aspects that should be indicated in a design brief of waiting areas**
 - Involvement of clinical nurses
 - Number of patients
 - Architectural quality
 - Hygiene
 - Privacy
 - **Overview of the Design Manual**
 - Give nurses visualisation
 - Communication tools across disciplines
 - Nurses become autonomous
 - Give nurses evidence that the area will be amended

Findings based on the interviews with nurses indicate that nurses understand the concept of user-focused design approach and see that the involvement of patients and staff during design brief is important. Some elements that the nurses suggested were overlooked by both the designer and me, for example seating for overweight pregnant women. Moreover, clinical nurses not only view hospital standards as important but are also concerned about a patient's comfort, especially privacy. The nurses highlighted that it is one of the most important aspects of a hospital waiting room. Besides privacy, nurses also addressed that hygiene standards and useful information (i.e. waiting time, overview of treatment plans) should be implemented in user-focused waiting room. Findings from the interviews resembled the existing knowledge about EBD and HE approaches, where hospital physical elements have affect patient stress levels. Finally, the Design Manual is a cross-disciplinary communication tool that helps accelerate the design process. Nurses also stated that they can be autonomous for a simple renovation or design project of the waiting area using the Design Manual. The manual acted as a catalyst between cross-disciplinary roles that were nurses and hospital designers in this case. The manual brings the same understanding and realistic pictures to nurses. However, the manual needs to be tested and updated regularly in order to perform as a useful tool for user-involved design approaches.

4.4 PAPER 4: OPTIMISING PATIENT'S JOURNEY AND WAITING EXPERIENCE IN PUBLIC HOSPITALS: A QUALITATIVE STUDY COMPARING THAILAND AND DENMARK

Prugsiganont, S., Jensen, P. A. (2020) 'Optimizing patient's journey and waiting experience in public hospitals: A qualitative study comparing Thailand and Denmark', Design for Health (in review process).

The objective of Paper 4 is to investigate and compare Thai and Danish patients' experience and perspectives regarding their waiting experiences and care journey (Figure 4-21). Based on the literature review of user-focused approaches and findings suggested by nurses in Paper 3, it is necessary to involve patients and staff to optimise hospital design outcomes. Findings from Paper 3 led to the development of Paper 4, where my intention is to deepen the investigation towards hospital's end-users (patient and staff). Nonetheless, this paper focuses on patient's experience and opinions regarding hospital waiting areas and their care journey. Two aims were developed for this study. The first aim was to describe and compare patient waiting experiences during their journeys in two public hospital systems (Thailand and Denmark). The second aim was to obtain and compare information regarding patient needs to improve their waiting experience and well-being.

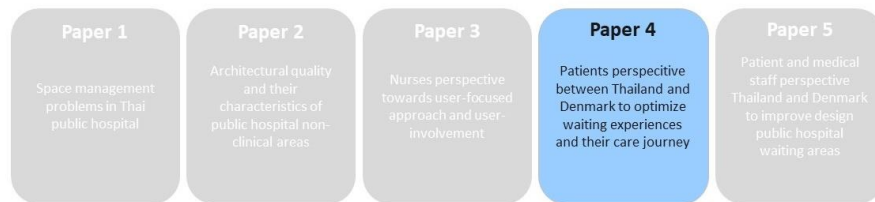


Figure 4-21: Brief purpose of Paper 4

Empirical data was collected through the interview of 21 patients which includes 12 patients from Maharaj Chiang Mai hospital, Thailand and 9 patients from Rigshospitalet, Denmark. The two hospitals were my main case studies. Data was analysed through thematic analysis (An ker et al., 2019; Erlingsson & Brysiewicz, 2017; Wrapson et al., 2017). I transcribed the interviews recorded verbatim and listened to the audio several times. I then re-read the transcripts and developed unit of meanings based on the literature review, theoretical framework and findings. My co-author and I then discussed *the units of meaning*. After the discussion, I began to *code* the transcripts. I then grouped the codes that had similar contents and determined *categories*. Finally, the co-author and I reviewed the expression of underlying meaning of the categories and established the *emerging themes*.

From the analysis of the interview transcripts, four themes emerge. The overall themes are similar for both Thai and Danish patients but specific aspects are different.

Theme from Thailand

Thailand Theme 1: *Structure and organisation of the healthcare system*

The structure and organisation of the Thai healthcare system has significantly impacted a number of patients. Most patients reported that the hospital was overcrowded with increased influx of patients on a daily basis. Patients stated that there was a high demand

for medical treatment but that there was a lack of resources, which includes insufficient healthcare distribution in rural areas. Lastly, some patients pointed out the lack of general practitioners in local community hospitals, which is also a major reason leading to the increased influx of patients in public hospitals.

Thailand Theme 2: Hospital management system

This theme is related to Theme 1 (structure and organisation of the healthcare system); participants (patients) mentioned the four areas that are lacking in relation to hospital management system. *First*, hospitals lacked long-term planning for architecture, master planning, future expansions and direction of future treatment and technologies. This is the major reason that hospital navigation is disorientating. *Second*, lack of expertise and knowledge in hospital planning, hospital facilities management and hospital design, including frequent failure to involve different stakeholders in each stage of the design process. *Third*, lack of patient-focused approach in hospital services and design. *Fourth*, lack of useful information about the queueing and navigation systems. Patients mentioned that the lack of queueing information hinder patients from planning their day due to the lack of information regarding waiting time. The disorientation of the hospital navigation system led to unnecessary time spent at hospitals. The combination of the four shortage areas lead to slow hospital services which, in turn, lead to long waiting time.

Thailand Theme 3: Physical requirements for hospital waiting areas

Four different categories of improvement emerged for hospital waiting areas, the categories are intertwined.

- **Control** - Patients expect that hospitals implement the concept of patient empowerment, where patients have control over their care journey. For example, patients do not have to depend on their family for pick-up and drop-off since hospitals provide these services. Patients also request control over waiting time, where hospitals provide an approximate waiting time.
- **Comfort** - Patients request comfort for long waits including (1) access to greenery and relaxed atmosphere, (2) comfortable chairs and (3) supporting facilities, such as nearby toilets, restaurants, beverages and hand sanitizers.
- **Hospital standards** - Seven aspects of hospital standards were mentioned by patients: cleanliness, hygiene, privacy, safety, noise level and access to daylight and outside view. The most important aspects for patients were cleanliness and hygiene followed by privacy and safety. However, privacy is still tremendously lacking in public hospitals due to the high number of patients. Patients with chronic illnesses preferred to have access to relaxed atmospheres, such as greenery or outside view.
- **Hospital space management** – The layout and organisation of the clinical and non-clinical areas in a hospital could affect patient experiences and journeys and be time-consuming. First, participants suggested that the hospital layout, both horizontal and vertical, is unorganised. For example, many clinics are located on a higher floor of the hospital, while the administrative offices are located on the lower floor. There was also a lack in patient data recording (Little & Watson, 1996) leading to a lack of information for further development of hospital areas to suit patient needs and usability.

Thailand Theme 4: Social structure and culture

The Thai social structure and culture influence journeys and waiting experiences. First, healthcare staff aim to provide good services to patients to compensate for slow hospital services and poor physical conditions. The second aspect pertains to the social hierarchy of affected patients' behaviour; half the patients accept the current physical conditions of the hospital and its services because complaining about hospital services might raise conflicts between patients and healthcare staff and could lead to even slower services.

Theme from Denmark

Denmark Theme 1: Structure and organisation of the healthcare system

- ***Distribution of Danish healthcare facilities*** - Patients stated that Denmark established a clear classification of hospital and healthcare services in which general practitioners acted as hospital gatekeepers. Participants also added that only in emergency cases were patients allowed to go to hospitals directly. Each public hospital provided different types of specific treatments and specialisations, creating an equal distribution of patient numbers across public hospitals. Moreover, patients added that the Danish healthcare system prioritised treatment of highly fatal and severe diseases.
- ***Implementation of an online medical service platform*** - Denmark has used the online healthcare platform Sundhed.dk since 2003 (Danish eHealth portal, 2020). The e-portal centralised patient medical information and gave patients and staff access to Danish healthcare services. The online portal allowed data transparency because it could access medical records and see doctors' comments.

Denmark Theme 2: Hospital management system

Most patients mentioned that medical clinics had been rearranged and relocated; this also includes the improvement of existing buildings amid preparations for new buildings. Patients also added that a patient-centred approach was employed in hospital services because patient needs and opinions were considered when modifying hospital systems and services. Furthermore, participants stated that hospitals provided useful information including appointment details and hospital map via e-mail, navigation and information centre and signage were at important spots.

Denmark Theme 3: Physical requirements for hospital waiting areas

Four interconnected categories emerged from the analysis; the categories were similar to those of Thai patients. However, the details were different.

- ***Control*** - Danish patients stated that they had control over their journey because the hospital provided uncomplicated navigation and facilities for vulnerable patients.
- ***Comfort*** - Patients stated that a hospital could be stressful; therefore they requested access to and views of greenery along with comfortable furniture, because these aspects created a relaxed, home-like atmosphere.
- ***Hospital standards*** - Seven aspects of hospital standards were mentioned by patients: hygiene, privacy, organisation of furniture, positive distractions, food and beverages, windows and outside view and useful information. Patients stated that privacy and hygiene were the most important aspects of hospital standards. Half of the participants wanted to have privacy for discussing private matters with their families or to be left alone when they received bad news.

- **Hospital space management** - Patients suggested new ideas for waiting area typologies. For example, outpatient clinic waiting areas should provide a zone for short and long waits to allow privacy, whereas inpatient clinics should provide two separate zones for socialising and privacy. However, one patient who had been to both Thai and Danish hospitals stated that the waiting experiences do not depend fully on hospital space management. He stressed on two important points: the physical environment of both Thai and Danish hospitals was similar, but Danish hospitals had a much better organised system; and the quality and services of Danish hospitals were better than Thai hospitals. He stressed that queueing information was important to positive waiting experiences as information about queueing gave the patients freedom and control over their life.

Denmark Theme 4: Social structure and culture

Patients emphasised that Danish cultures play important roles in the mentality of healthcare staff and patients. Most patients stated that they had good relationships with trusted medical staff who understood their life situations. Patients also added that Denmark has a low social status due to a flat hierarchy (Hofstede et al., 2011). Therefore, patients stated that they felt comfortable discussing their life situations with medical staff while waiting. Lastly, patients were encouraged to keep up their normal lives and routines as distractions from their illnesses.

4.4.1 Overall findings from both countries

The study showed that patients' experience and their medical journey is an eclectic mix of several components. The design of the physical environment along with space management is not the only major factor that has had an impact on patient waiting experiences and journey. The study pinpoints underlying issues of Thai and Danish patients' waiting experience and care journey which went beyond physical environment and design of the hospital. The core components were a concatenation where the healthcare system and the hospital management system played important roles in a patient's waiting experience and care journey.

Based on the findings, the four core components are: (1) structure and organisation of the healthcare system, (2) hospital management system, (3) physical requirements for hospital waiting areas and (4) the social structure and culture. These four components contributed to patients' waiting experience and care journey. Findings from this paper provided useful information that tribute to findings from Papers 1 and 3 where Paper 1 discussed both space management and the Thai healthcare system while Paper 3 focused on the design criteria for waiting areas and user involvement.

Although the papers provided factors that influence a patient's waiting experience and care journey, the findings are not sufficient to identify the relationships between each component (the emerged themes). The paper requires further study for more data to create clear relationships between each component and to be able to create guidelines to further improve the Thai healthcare system and the design of waiting areas. The study requires a comparison between countries with similar cultural contexts and healthcare competences.

4.5 PAPER 5: THAILAND VS DENMARK: IMPROVING PATIENT JOURNEY AND WAITING AREA FACILITIES THROUGH PATIENT AND STAFF OPINIONS

Prugsiganont, S., Jensen, P. A. (2020) 'Thailand vs Denmark: Improving patient journey and waiting area facilities through patients and staff's opinions', Facilities (in review process).

Paper 5 continues to emphasise the issue of user experience. However, in this paper I included the opinion and perspective of both patients and medical staff on waiting areas and patient care journey (Figure 4-22). Paper 5 has two purposes: to compare Thai and Danish patient/medical-staff opinions and perspective towards patient waiting experiences and care journey, and to conclude the empirical data that was collected throughout the doctoral study. Three research questions were framed for this paper. First, what are the characteristics and physical conditions of the non-clinical areas in Thai and Danish public hospitals? Second, what are the differences and similarities between patient and staff experiences and opinions regarding hospital waiting areas? Third, how can the information from patient and staff opinion and experience optimise patient care journey and the design of waiting areas? Moreover, this paper provided useful data that also answered the research questions I framed in Paper 2 (what can hospitals learn from each other and how can the knowledge of non-clinical hospital design, focusing on patients be shared between these hospitals?).

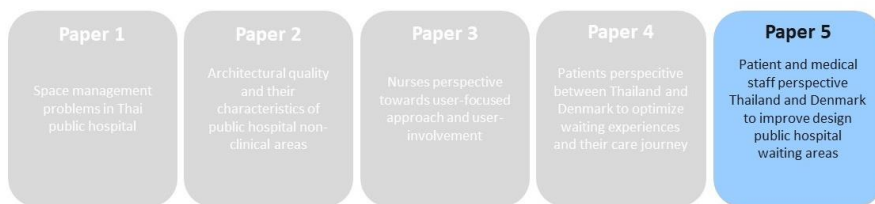


Figure 4-22: Brief purpose of Paper 5

The empirical data was collected through two steps. First step was walk-through observations of non-clinical areas at Maharaj Chiang Mai hospital and Rigshospitalet hospitals. I implemented a combination of the three evaluation guidelines: Clinic Design for POE (The Center for Health Design, 2015), evaluation guidelines for healthcare facilities (Van der Voordt et al., 2005) and Rigshospitalet's waiting area assessment guidelines (details provided in Chapter 2). Findings from this section led to the study in the second section. The second section consisted of the interviews with patients and medical staff from both Maharaj Chiang Mai hospital and Rigshospitalet. This paper presents data from the interview of 38 participants, which includes 12 Thai and 9 Danish patients and 9 Thai and 8 Danish medical staff. The interviews were transcribed and I applied the thematic analysis approach (An ker et al., 2019; Patterson et al., 2017). Thus, the analysis steps were similar to that of Paper 4, where the co-author and I established the *unit of meanings* based on literature review and research questions. Later, I *coded* the transcript and developed *categories* representing groups of codes that had similar content. We then discussed the content of the categories and identified the emerging *themes*. Finally, we deliberated the meaning of emerging themes for findings validity.

Findings are divided into two sections where the first section presents findings from the walk-through observations of non-clinical areas of Maharaj Chiang Mai hospital and Rigshospitalet. The second section provided findings from the interviews with patients and medical staff of Maharaj Chiang Mai hospital and Rigshospitalet.

- **Walk-through observations** - Findings from this section are a combination of walk-through observations presented in Paper 1 together with data collection that was carried out during the registering step at Rigshospitalet (methodology chapter STEP 2 Section 3.2). Findings from this section indicate that Maharaj Chiang Mai hospital had lower architectural quality and physical environment than Rigshospitalet. However, the two hospitals shared four similar waiting area typologies, one type of waiting area was 'unplanned waiting area' which is only found in Maharaj Chiang Mai hospital. The findings are illustrated in Figure 4-23.

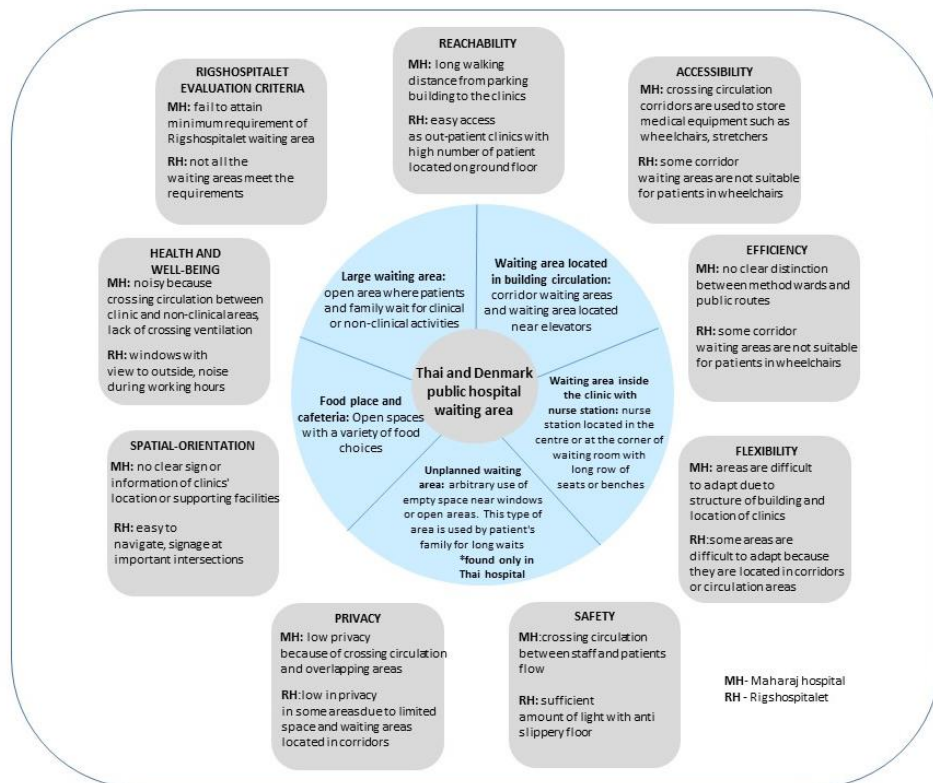


Figure 4-23: The current physical condition of Maharaj Chiang Mai hospital and Rigshospitalet and waiting area characteristics

Part of the findings had been presented in Papers 1 and 2; however, the findings in this paper compare the physical conditions of non-clinical areas between Maharaj Chiang Mai hospital and Rigshospitalet. The findings also indicate that the two hospitals had similar architectural elements and physical environment. Nonetheless,

Rigshospitalet had provided a better space management/maintenance plan than Maharaj Chiang Mai hospital.

- **Interviews with patients and medical staff** - Similar themes to Paper 4 emerged. The comparison data between two groups of users (patients and medical staff) enable me to develop more precise findings. Therefore, the emerged themes yielded more precise information than Paper 4. Moreover, the interview analysis presented sufficient insights regarding the unanswered research question that had been framed in Paper 2. A comparison of detailed findings along with patient and staff quotes are presented in Appendix 9. Five themes emerged from the analysis, both Thailand and Denmark shared similar themes but the categories and sub-categories are different.

Theme from Thailand

Thailand theme 1: *Structure and organisation of the healthcare system*

Category 1.1: Incongruence between healthcare resources and medical treatment

Patients mentioned an influx of patients which led to time consuming processes while the medical staff mentioned limited healthcare resources have resulted in lack of hospital spaces.

Category 1.2: Centralised healthcare service

Patients mentioned lack of healthcare services including insufficient healthcare distribution in rural areas, which is a major reason for the influx of patients in large public hospitals. The medical staff suggested that the healthcare system in Thailand should be decentralised and prioritised according to diseases.

Thailand theme 2: *Lack of screening processes and organised queueing management system*

Category 2.1: Lack of long-term management and planning

Both patients and staff mentioned the lack of long-term management and planning, including architectural planning, master planning and direction of future treatments and technologies.

Category 2.2: Lack of screening processes and organised queueing management system

Patients mentioned that everyone can walk into large hospitals without appointment. The hospital also does not prioritise based on the illness. The medical staff mentioned technologies could help decrease the time for non-medical processes, such as registration or intake.

Thailand theme 3: *Hospital space management and planning process*

Category 3.1: Overall physical environment

Sub-category 3.1.1: Current conditions of hospital physical environment

Patients mentioned poor physical condition of the hospital due to lack of space management and organisation of clinic locations whereas the medical staff mentioned crossing circulation between services and patient flow which can be unhygienic.

Sub-category 3.1.2: Issues in hospital design process

Patients and the medical staff mentioned the lack of three main aspects leading to failure of space management. First, lack of user involvement and patient-focused approach in the design process. Second, lack of expert knowledge in hospital planning and facilities management and failure to involve different stakeholders in the design process. Third, lack of knowledge leading to unorganised clinic layout, disorienting hospital navigation, failure to meet hospital accreditation standards and incompetent hospital functions.

Sub-category 3.1.3: Suggestions for improvement

The medical staff suggested four topics that can improve hospital space management. First, hospital accreditation standards and functions are the most important aspects in the design process. Second, user involvement is key to optimising the design of the hospital. Third, related functions of both clinical and non-clinical areas should be located near each other. Fourth, hospitals should provide clear guidelines of building life cycle.

Category 3.2: Hospital waiting area***Sub-category 3.2.1: Current conditions and characteristics of waiting areas***

Patients suggested that the hospital should avoid locating waiting areas along corridors due to lack of privacy. The medical staff mentioned that waiting areas were not integrated into the original design of the hospital, which is why the areas tend to lack privacy and comfort, and do not suit patient profiles.

Sub-category 3.2.2: Suggestion for improvement

Five topics were suggested for the improvement of hospital waiting areas, where three topics were mentioned in Paper 4 (control, comfort and hospital standard) and two new topics emerged during the analysis. **Access** to nurse stations to benefit both the patients and the medical staff. **Area typology and supporting facilities** - two types of areas were suggested, which includes: 1) the area where *patients wait before or during medical processes*, this area should provide comfort and information; 2) *area where patients wait after medical processes*, this area can include supporting facilities and comfort.

Thailand theme 4: Patient needs and patient-focused approach

The medical staff mentioned the difference between patient needs and patient-focused approach where the former refers to focus on the patient getting better and being treated. On the contrary, patient-focused approach refers to the staff attending to patients based on individual life situations and circumstances.

Thailand theme 5: Social structure and culture

This theme is similar to Paper 4 where patients mentioned the kindness shown by the staff, while the medical staff stated that they focus on providing good services to patients. The staff added that every patient is always accompanied by three to four family members.

Theme from Denmark

Denmark theme 1: *Structure and organisation of the healthcare system*

Category 1.1: General issues of the Danish healthcare system

Patients and staff mentioned overcrowding at hospitals during working hours due to patients being transferred to outpatient clinics from other regions.

Category 1.2: Distribution of Danish healthcare facilities

Clear classification of healthcare services and prioritisation of severe diseases.

Category 1.3: Implementation of an online medical service platform

Implementation of online healthcare system Sundhed.dk (Danish eHealth portal, 2020).

Denmark theme 2: *Hospital management system*

Category 2.1: Organised hospital service providing useful information

Patients mentioned that hospitals provided useful information, where appointment details and map were sent to patients via e-mail. Information centres located at important intersections of the hospital.

Category 2.2: Implementation of user-focused approach and change in hospital service

Both patients and medical staff stated that the term patient-focused was integrated in the hospital's treatment plan and in the way the medical staff approached patients.

Denmark theme 3: *Hospital space management and planning process*

Category 3.1: Overall physical environment

The medical staff added that waiting areas were not the first priority of hospital planning. Many waiting areas have been switched to clinics due to lack of space.

Sub-category 3.1.1: Suggestion for hospital design process

Same suggestions as the ones that Thai patients and medical staff suggested. First user-involvement leads to area efficiency that fits patient and staff needs. Second, hospital functions and standards are the most important aspects for the design process. Third, hospitals should provide clear guidelines of building life cycle.

Category 3.2: Hospital waiting area

Sub-category 3.2.1: Current conditions and characteristics of waiting areas

Patients mentioned that waiting areas are always located in building circulation areas and some areas lack privacy and hygiene and do not support hospital functions and patient profiles. The medical staff added that waiting areas are often less welcoming and do not have a relaxed atmosphere because the areas were not originally integrated in the hospital design.

Sub-category 3.2.2: Suggestions for improvement

Same as Thailand, five topics were mentioned by patients and the medical staff, which includes control, comfort, hospital standards, access and waiting area typology and supporting facilities. However, the medical staff suggested two types of waiting areas 'long wait areas' and 'short wait areas' where each area holds different characteristics. Long wait areas should provide comfort and information for patients, whereas short wait areas provide information and can be located in building circulation areas. Supporting facilities can be used for long wait areas.

Denmark theme 4: Patient needs and patient-focused approach

The medical staff here expressed the same opinions as the Thai medical staff regarding the concept of patient needs and patient-focused approach. However, the Danish medical staff added that a patient-focused approach is a balance between patient expectations, hospital functions and practicality.

Denmark theme 5: Social structure and culture

Similar aspects as Paper 4 were mentioned by patients. The medical staff added that they were aware of each patient's circumstances and life situations. They also emphasised that they valued a patient's normal routine and encouraged them to keep up with their normal life.

4.5.1 Overall findings from both countries

This paper is a chronology version of Paper 4 in which findings from Paper 4 contributed to the development of Paper 5. The two papers supplement each other creating insights with regard to a patient's experiences and care journey. The paper concludes that five core components emerged from the analysis in which four factors had been mentioned in Paper 4. However, the findings presented in this paper have become more precise as the data included a comparison analysis of two different groups of end-users (patients and medical staff). Findings from Paper 5 aligned with that of Paper 4 which justifies the idea that positive patient waiting experiences and care journey do not depend solely on physical environment and design of the waiting areas but depend on a combination of several factors, including healthcare system, hospital management system, patient needs and patient-focused approach, and social structure including culture.

Further research is suggested, similar case studies and groups of users should be considered for comparison studies to establish a clear relationship between each factor and to provide insights into the influence of social structure and culture in the hospital design process. The findings from Papers 4 and 5 seem to mildly indicate that social structure and culture might hinder the development of the Thai healthcare structure and hospital design process.

5. DISCUSSION

The overall purpose of this study is to investigate the physical environment of public hospitals' non-clinical areas with the aim of improving the physical conditions of public hospitals' *waiting areas*. Throughout the investigation, I have applied two main approaches: healthcare facilities evaluation and presentation of the new paradigm of hospital design. The healthcare facilities evaluation investigated the current physical conditions of public hospital non-clinical areas. The new paradigm of hospital design was applied in order to outline existing knowledge of the relationship between a hospital's physical environment and patients' health outcomes.

A building evaluation approach served as the foundation for this PhD study. The theories provided me with the investigation tools that led to new insights and an overview of public hospitals' physical environments and physical conditions, the characteristics of hospitals' non-clinical areas, and the context of public hospitals, as presented in Papers 1, 2, and 5. The new paradigm theories of hospital design provided me with knowledge of the research that has been done in relation to hospital design and patients' health outcomes. These theories also provided a background for structuring my investigation into user involvement (Paper 3), which was later developed into a comparison study of the experiences and perceptions of Thai and Danish patients (Paper 4). Then, I investigated further, comparing the perceptions and opinions of both patients and medical staff in order to establish specific information in relation to the patient care journey with the aim of improving their waiting experiences (Paper 5).

Part of this PhD thesis involves a comparison study between two countries (Thailand and Denmark). I supplemented the approaches implemented by these two countries with other related theories, including those relating to the organisation of healthcare systems, the connection between a hospital environment and patient stress levels, and the psychology of waiting lines and cultural settings. The combination of these existing research strands constitute the background literature and literature framework (Chapter 2) and later supported the discussion of findings (this chapter).

As listed in table 1-1 and in the summary of findings in Chapter 4, the five papers included in this PhD thesis have investigated the overall purpose of this study from different angles, yielding a number of findings. The findings constitute fulfilment of the main research purpose framed for this study.

In the following section, I answer the four research sub-questions. The first sub-question was addressed mainly in Paper 1, the second sub-question was addressed in Paper 2, the third sub-question was addressed in Paper 3. The fourth sub-question was addressed in Paper 4 and Paper 5. Furthermore, Paper 5 also addressed an unanswered research question formulated for the study in Paper 2.

5.1 ANSWERING RESEARCH SUB-QUESTION 1

The first sub-question intended to provide a better understanding of the Thai healthcare system and the current situation in public hospitals regarding how hospitals manage their spaces and what the current physical conditions are of the non-clinical areas of Thai public hospitals. The sub-question (SUB-RQ), which includes these three aspects, is formulated as follows:

SUB-RQ 1: What is the current situation in large Thai public hospitals and how does this current situation affect the organisation and space management of non-clinical areas in Thai public hospitals?

This study identified two main findings: the first relates to the structure of the Thai healthcare-system, and the second deals with the physical conditions of the non-clinical areas in the Thai public hospital studied. The first sub-question represents the ontology of my research assumption, as the study was inductive (Creswell et al., 2018; Saunders et al., 2015). I focused on the daily situation of a Thai public hospital which led to the development of knowledge on how the structure of the Thai healthcare system affects the organisation and space management of the hospital's non-clinical areas.

A study of the literature relating to the Thai healthcare context revealed details of the current situation of the Thai healthcare system. Four factors were identified from the literature review that disclose the incompetency of Thai healthcare services. First, the implementation of a universal coverage scheme in 2002, which has tremendously improved access to medical treatments and services among people with low-income, unemployed, vulnerable, and chronic condition status (Limwattananon et al., 2012; Paek et al., 2016). According to Sumriddetchkajorn (2019) more than 10% of the entire Thai population are still considered poor and unemployed. Based on the literature, low-income, elderly, and marginalised groups of people are the main users of public hospital services and public health facilities, including both outpatient and inpatient wards (Hughes and Leethongdee, 2017; International Labour Office, 2017; Paek et al., 2016).

Second, the lack of local practitioners serving as healthcare gatekeepers. According to the Kingdom of Thai health system review (2015), Thailand has never set up regulations for primary health services that oblige Thai citizens to contact a general practitioner before being referred to a large public hospital (Jongudomsuk et al., 2015; Pongpirul et al., 2009; Prakongsai et al., 2009; Satayavongtip et al., 2016). The Thai Ministry of Public Health has also never formulated any regulations or requirements to ensure people use local healthcare centres for primary care services (Thai health system review, 2015). This situation has led to easy access of public hospitals, as every Thai citizen can just 'walk in' to any public hospital for any reason.

Third, there has been a failure to decentralise public healthcare services and there is a lack of distribution of public community health centres in rural areas. Although universal health coverage scheme was beneficial for bringing healthcare services to Thai citizens, the scheme also created drawbacks for the public health sector (Paek et al., 2016). A previous study highlighted that the universal coverage scheme increased health care utilisation (Paek et al.,

2016); however, many studies have cited the insufficiency of the policy's financing as a potential threat to service quality and access. Moreover, the universal coverage scheme put a strain on the Thai healthcare system due to a lack of distribution of the healthcare services, despite that the access to medical treatments had increased (Paek et al., 2016). Inadequate infrastructure, along with the 'brain drain' resulting from skilled health workers moving from public to private sectors and rural to urban areas, have been documented as being problematic on the supply side of the public sector (Antos, 2007; International Health Policy Program, 2007; Sakunphanit, 2006; Sakunphanit & Suwanrada, 2011). Accordingly, these issues have caused service quality problems in the universal coverage scheme, leading to long waiting times and limited service access (Damrongplasit & Melnick, 2009; Kirduang, 2011; Limwattananon et al., 2011, 2012; Suwannarach et al., 2010). Thailand claimed that the country has a de-centralised healthcare system (the The Kingdom of Thailand Health System Review, 2015). In fact, the implementation of the de-centralising healthcare act was unsuccessful (Limwattananon, 2007; The Kingdom of Thai health system review, 2015). The Thai Ministry of Public Health had been trying since 1999 to decentralise and provide equal access to healthcare services for Thai citizens. This aim was carried out by transferring the healthcare management's responsibility for primary and secondary healthcare services from Ministry of Public Health to local municipalities (Jongudomsuk et al., 2015). However, the devolution of responsibility was unsuccessful, as less than 1% of health centres (46 out of 9,786) devolved their power from the Ministry of Public Hospitals to their local municipality in the past 10 years (Jongudomsuk et al., 2015; Kingdom of Thai Health System Review, 2015). The main reason for wanting to devolve health management responsibility is to avoid bureaucratic processes, resulting in faster and better services (Jongudomsuk et al., 2015).

Fourth, there were limited numbers of government hospitals. According to the Ministry of Public Health (2016), Thailand has 1,033 public hospitals, including 41 large hospitals (500–1,500 beds), 269 medium hospitals (50–500 beds), and 723 community hospitals (0–50 beds) (the Thai Ministry of Public Health, 2020). The ratio between the number of hospitals and number of patients is 1: 66,795 of the total Thai population of 69.9 million (Thai Statistical Bureau, 2019). However, previous literature has noted that Thai people prefer to go to large public hospitals as their typical health-seeking behaviour (Paek et al., 2016), suggesting that the ratio between patients and public hospitals might be higher.

The combination of four important factors constitute the imbalance between the access to public healthcare services and the infrastructure of the public health system. The universal coverage scheme increased access to public health care among Thai citizens, but the country failed to provide sufficient healthcare infrastructure. Insights obtained from the literature support the findings from this study (Paper 1), which examined the relationship between number of patients and the ways a Thai public hospital managed and developed its medical buildings.

This study's findings showed that the daily situation of a large Thai public hospital involves overcrowding. This finding is consistent with literature linking the four factors of (1) launching of the universal coverage scheme (2) Absence of local general practitioners serving as gatekeepers and a lack of local health services (3) Failure to decentralise public health management (4) Limited number of government hospitals. These factors highlight that there is a contradiction between healthcare access and healthcare services—there is a

tremendous need for medical treatments, but the healthcare services are insufficient. This empirical study reveals that the daily situation of a Thai public hospital involves overcrowding and slow services. These issues also affect hospital space management and hospital space development. Figure 5-1 shows the daily situation in a public hospital waiting area.



Figure 5-1: Daily situation in a Thai public hospital waiting area

The literature review of Thai public health system and this study findings disclosed the root problems of the Thai healthcare structure. Hospital space management, organisation, and development are also affected by the hospital current situation, especially in relation to the high number of patients. The literature on space management strategy (Becker & Steele, 1995; Jensen, 2006; O'Mara, 1999) listed three approaches that can be used for strategic adaptation of spaces (1) Incremental (2) Standardisation, and (3) Value-based. This study findings revealed that Maharaj Chiang Mai hospital had been implementing 'Incremental' development in which the adaptation of space was made only in small steps when necessary and extra space was usually rented in order to avoid major capital investment (Becker et al., 1995; O'Mara, 1999; Jensen, 2006). This study's findings showed that Maharaj Chiang Mai hospital has expanded extensively since the first day that it was built. The approximate area of the hospital has increased from 2,325 to 200,000 square metres over the past 60 years (Maharaj Chiang Mai Hospital, 2018). Although the space increase has been substantial, the development and expansion were done slowly; according to this study findings, one building was added every 10 to 15 years (Maharaj Chiang Mai Hospital, 2017). The major reason for the increased space was the high number of patients being treated within limited available space—approximately 1.48 million patients yearly (Maharaj Chiang Mai hospital, 2020). The hospital expanded slowly, wherever and whenever it was possible to do so.

This study findings have also suggested that incremental development impacted on the hospital's physical environment and functional quality. Although there is still lack of literature focusing on the impact of incremental development on the functional quality of the building, Post Occupancy Evaluation (POE) theory can be implemented here (Preiser et al., 1989, 1995, 2010). The Center of Health Design (2015) established specific POE building guidelines for healthcare facilities evaluation, suggesting walk-through observations as an important tool for evaluating and auditing functional, quality healthcare spaces (Blakstad et al., 2009, 2010; Fronczek-Munter, 2016; Hansen, Blakstad, & Knudsen, 2011). A literature review focusing on architecture functionality suggested that healthcare facilities should provide eight aspects, including (1) reachability, (2) accessibility, (3) efficiency, (4) flexibility, (5) safety, (6) spatial orientation, (7) privacy, and (8) health and physical well-being (Huisman et al., 2012; Van der Voordt & Van Wagen, 2005). Details of the healthcare evaluation criteria are described in Paper 1. This study findings indicated that non-clinical areas of the Maharaj Chiang Mai hospital had poor architectural quality. According to the POE and walk-through observations, the functional quality of the hospital's non-clinical areas fell below the Thai Healthcare Accreditation Standard, where the areas did not meet requirements for patients' safety or infection control (Thai Healthcare Accreditation Standard, 2020). Finding from this study added new information to the existing literature regarding strategic adaptation of space management (Jensen, 2006; O'Mara, 1999). This study findings suggest that a large public hospital that expands through incremental space development might result in low functional quality.

This study further investigated whether incrementalism, together with overcrowded spaces, is responsible for the poor functional quality found in non-clinical areas. A literature review on functional floor plan analysis (Van Hoogdalem et al., 1985; Van der Voordt et al., 1997; Vander Zwart et al., 2015) and spatial configuration (Van der Zwart, 2014) revealed techniques for architectural floor plan analysis (Paper 1), yielding insights about people's movements and the spatial arrangement of buildings. The findings from this study reveal two factors that caused poor functional quality in hospital non-clinical areas: a lack of integration of Thai culture in the hospital's design and architecture and a lack of appropriate strategic space planning that was specific to the Thai healthcare system. This finding was supported by the literature review on building *usability*, which showed that the context, culture, and users' experiences should be integrated into the design of a building (Alexander, 2008, 2010; Fronczek-Munter, 2011; Jensen et al., 2011). According to the Maharaj Chiang Mai hospital (2017), the hospital had borrowed the design concept from western hospitals, where a user-focused approach was not the main concern of hospital design until the emergence of Evidence Based Design (EBD) theory in the 1980s (Hamilton, 2003; Ulrich, 1984). Therefore, users' contexts and needs were not considered in any of the Maharaj Chiang Mai hospital buildings.

To conclude and answer sub-question 1, the current situation in the Thai public hospital studied here is overcrowding and slow service, which is due to the structure and organisation of the Thai healthcare system, which results in a high number of patients using the hospital. This current situation, especially the high number of patients, affects the organisation and space management of hospital. Maharaj Chiang Mai hospital was built using incremental space development, where the hospital expansion took place 'bit-by-bit'. The functional quality of non-clinical areas fail to meet hospital accreditation standards and

highlight a lack of integration of Thai culture in the hospital design and a lack of appropriate strategic planning that fits the Thai healthcare system.

5.2 ANSWERING RESEARCH SUB-QUESTION 2

The second sub-question aimed to investigate the characteristics and the arrangement of the non-clinical areas in a public hospital. Sub-question 2 is a continuation of sub-question 1, which provided an overview of the physical conditions of the non-clinical areas of a Thai public hospital. The second sub-question aimed to determine the general characteristics of non-clinical areas of a hospital by looking at different non-clinical areas in public hospitals in multiple locations and contexts. The question is as follows:

SUB-RQ2: What are the typology and architectural characteristics of public hospital waiting areas?

The observations made via a case study of multiple hospitals resulted in the development of an architectural *typology of waiting areas*. The findings from the case study indicated seven common types of waiting spaces, including: (1) a large waiting area, (1a) a large waiting area without zoning, (1b) a large waiting area with zoning, (2) a long corridor waiting room with chairs along the walls, (3) a small area beside a corridor, (4) a waiting space next to a window, (5) an outdoor waiting area, (6) a food place and canteen, and (7) an unplanned waiting area. Details of the seven waiting-area typologies are presented in Paper 2.

Existing research has focused on a new paradigm of hospital design in which patients are viewed as end users and where hospitals are expected to provide services based on patients' needs (Becker & Parsons, 2007; Ferguson, 2002). Ulrich (1984) and Ulrich et al. (2004, 2006b) established the concept of *Healing Environment*, which later developed into EBD theory. EBD theory emphasised the concept that a hospital's physical environment has an impact on patients' well-being and health outcomes (Connellan et al., 2013; Fronczek-Munter, 2016). Findings from walk-through observations and evaluations of hospital waiting areas by various scholars (Blakstad et al., 2009, 2010; Fronczek-Munter, 2016; Hansen, Blakstad, Knudsen, 2011) have illustrated different levels of functional quality. This study findings are aligned with the existing knowledge of EBD and HE (Connellan et al., 2013; Malkin, 2008; Ulrich et al., 2004, 2008), hence findings from this study added the new knowledge to what we have already known about the impact of hospital architecture on patient health outcomes.

Waiting areas that belong to newly built hospitals demonstrate high functional quality because EBD, Healing Environment, and patient-focused design approaches were implemented in the areas. These waiting areas provide certain architectural characteristics, including large open spaces, zones, a variety of seats, floor-to-ceiling windows, access to greenery and an outside view, comfort, and privacy (Connellan et al., 2013; Huisman et al., 2012; Harris, McBride, Ross, & Curtis, 2002; Malkin, 2008; Ulrich et al., 2004, 2006b, 2008). In this study, hospitals that represented these characteristics in their waiting areas include St Olav's hospital, Khoo Teck Puat hospital, and the newly renovated areas of Rigshospitalet. By contrast, waiting areas located in old hospital buildings had low functional quality, and the concepts of EVD, Healing Environment, and patient-focused approach seemed to be lacking in the design of these areas. These waiting areas had certain architectural

characteristics, such as large areas with no zoning, one type of seating—usually a long roll of seats or benches, no access to windows or daylight, and a lack of privacy and comfort. Based on this study findings, hospitals that represented these waiting area characteristics are Maharaj Chiang Mai hospital, Chulalongkorn hospital, and older waiting areas in Rigshospitalet. The architectural characteristics of both high and low functional quality of the waiting areas can be found throughout waiting areas of type 1 to 6 (from the large waiting areas to the food place and canteen). In large public hospitals, waiting areas share the same typology, however the areas have different architectural characteristics.

From observations of buildings, this study also found one distinguished waiting area type, the unplanned waiting area, which was only found in Thailand. Although all the waiting areas shared some similarities, the architectural details are slightly different due to each hospital-specific context. This finding is consistent with literature that focuses on usability and user-focused design approaches (Alexander, 2005, 2008, 2010; Blakstad et al., 2010; Fronczek-Munter, 2016; Jensen et al., 2011) where a user's specific context, experiences, and culture influence the design and use of space.

To conclude and answer sub-question 2, the observation of the case study hospitals resulted in the development of a public hospital waiting area typology, offering *seven* common types of waiting spaces. The architectural characteristics of these types can vary. Waiting areas that integrated EBD and Healing Environment characteristics provided waiting spaces that focused on patients' comfort and privacy (i.e., different zones, several types of seats, access to daylight and greenery). By contrast, waiting areas that lack an EBD or Healing Environment approach have poor functional quality and share similar architectural characteristics (i.e., dark with no access to daylight, no zoning, and one type of seat).

Answering sub-question 2 led me to research sub-question 3, where I focused on the influence of user involvement and user-focused design approaches in hospital design processes.

5.3 ANSWERING RESEARCH SUB-QUESTION 3

The third research sub-question emphasised the topic of user-focused and user-involvement approaches. It aimed to investigate nurses' involvement in the hospital design process and explore clinical nurses' perspectives on the concept of user-focused design approach as implemented in the design of hospital waiting areas. The question is as follows:

SUB-RQ 3: How can the implementation of a user-focused approach through the involvement of clinical nurses support the design process of hospital waiting areas?

This study investigated nurse involvement and nurses' opinions about a user-focused approach to design; Paper 3 presented details of this study. Derived from the existing research on user involvement and user-focused approaches, the concept of being *user-focused* stems from the term *user-centred design*, where the goal is to pay attention to usability intentions, user characteristics, the environment, and the service or process at each stage of the design process (Fronczek-Munter, 2016; Henry & Thorp, 2004; Rubin, 1984;). Thus, in the field of facilities management, the term *user-focused* is interconnected with the term *usability*, where building usability focuses on creating buildings, facilities, and spaces that support users' needs, contexts, and experiences (Alexander, 2005, 2010; Blakstad et al., 2010; Fronczek-Munter, 2016; Jensen 2010, Jensen et al., 2011). To create a high degree of usability, use-involvement should be integrated into the design process (Alexander, 2010; Binder & Brandt, 2008; Stovang et al, 2014).

The approaches provided by the literature on user-focused design and user involvement in design development formed the basis of this study. (Binder & Brandt, 2008; Fronczek-Munter, 2016; Storvang et al., 2014). I applied two techniques from the user-involvement method (Fronczek-Munter, 2016) to ensure that usability and a user focus approach was implemented in the design of waiting areas. The two techniques included meetings between three parties (a hospital planner, a researcher, and clinical nurses) and an interview with clinical nurses (Paper 3).

The literature relating to user involvement also indicated that intensive user involvement and evaluation with users should only be done when managed properly. It should not raise incorrect expectations and should take place early in the briefing process. Involvement and evaluation of users should not be just a symbolic gesture, but should involve a real dialogue and co-creation process, where the outcome can be further used in the next phases of the project (Fronczek-Munter, 2016; Nardelli, 2014.) In this study I used the specific design guidelines of the literature to manage and establish precise steps of user involvement. Thus, the *Rigshospitalet Design Manual* was used as a specific design guideline; the manual focuses only on the design of waiting areas and has two main focus points: (1) Patient needs through user involvement: the manual contains Rigshospitalet patient profiles and their needs, waiting room types, and a furniture catalogue (i.e. chairs, tables, lamps) (2) Clear meeting guidelines for stakeholders: meeting should be conducted through collaboration of different groups of users, representing medical staff, the project manager, and the hospital's architect. During the meeting, five topics (user wishes, patient profiles, purchasing process, removal/demolition, and recycling process) will be discussed and clarified.

The Rigshospitalet Design Manual is the communication tool that developed an understanding between two groups of users (nurses and hospital designers) (Broberg et al., 2011; Carlie, 2002, 2004; Fronczek-Munter, 2012; Star & Griesemer, 1989; Wenger, 2000). Moreover, the inclusion of Rigshospitalet patient profiles in the design manual is an example of implementation of the concept of *persona* (Nielsen, 2013; Grudin & Pruitt, 2002), a technique that applies a user-focused approach in the design process. This is inconsistent with the literature review, which discussed transferring users' needs in order to optimise the design process (Chapter 2), where patient needs are transferred to patient's profile (personas) presented in Rigshospitalet Design Manual, designers and nurses used patient profiles as criteria to discuss the possibility to create welcoming waiting area (Paper 3). The patient profiles in this case represented real patients of the Rigshospitalet, and their needs and requirements were considered during the design process (Alexander, 2005, 2010; Blakstad et al., 2010; Fronczek-Munter, 2016; Jensen 2010, Jensen et al., 2011).

Furthermore, this study's findings were supported by the literature of user involvement, where a positive design outcome is considered to have been delivered when the involvement is managed properly (Fronczek-Munter, 2016). Designers and users having the same understanding and expectations is the key to a successful user-involvement approach (Fronczek-Munter, 2016). This study also showed that the involvement of end users (clinical nurses) contributes to the hospital design process by providing insights that lead to positive design outcomes. Findings from this study yield that nurses can specifically pinpoint requirements that might be overlooked by hospital planners (Fogarty & Cronin, 2008), such as exact number of patients visiting the clinic, patient profiles, patients' needs, capacity of space (i.e. storage room), and specific types of furniture required (i.e. reclining armchairs for pregnant women). These requirements provide safety and comfort for patients; the nurses also emphasised that a patient's stress can be related to their level of comfort and privacy in waiting areas.

To conclude and answer research sub-question 3, the implementation of a user-focused approach that involves clinical nurses can contribute to positive design outcomes. Clinical nurses can provide insights and requirements that might be overlooked by hospital planners and designers, for example, space capacity, specific patient profiles and their needs, and the exact number of patients visiting the clinic. Thus, user involvement and a user-focused approach should be carried out. In order to manage this process properly, clear and precise guidelines that provide step-by-step instructions for user involvement should be implemented during the design progression to ensure that each party has the same understanding and expectations.

User involvement is a technique used to achieve a high degree of user-focused design and usability (Fronczek-Munter, 2016; Rubin, 1984). Another core element that can lead to high degree of usability is to take users' experiences and perceptions into consideration during the design brief (Alexander, 2008, 2010; Jensen, 2010). With this in mind, answering sub-question 3 led me to sub-question 4 (last sub-question), where I concentrated on comparing the specific context of end users in Thailand and Denmark. I focused on exploring the experiences and perceptions of Thai and Danish patients and medical staff in order to glean insights that could be used to optimise the design of public hospital waiting areas.

5.4 ANSWERING RESEARCH SUB-QUESTION 4

The last sub-question concentrated on investigating and comparing Thai and Danish patient and medical staff experiences, opinions, and perceptions of public hospital waiting areas. The last sub-question had two aims; first it aimed to optimise patients' waiting experience and their care journey through an understanding of the perspective of patients and medical staff. Second, it aimed to explore and compare patient and staff experiences and perceptions of waiting areas in public hospitals in Thailand and Denmark. Papers 4 and 5 provided details of the study; the last sub-question was framed as follows:

SUB-RQ4: Which aspects of patients' and medical staff's experience and perceptions of hospital waiting areas can be used to optimise patients' waiting experience and care journey? Further, are there similarities or differences between the experiences and perceptions of Thai and Danish patients and medical staff of public hospital waiting areas?

The study comparing Thai and Danish patient and medical staff experience and perceptions of non-clinical hospital areas yields a number of important findings. This proves the credibility of the comparison study and gives justification for further studies on patient and medical staff experiences, perspectives, and opinions. The following sub-sections elaborate my answer to the last research sub-question.

5.4.1 Confirmation of similarity of waiting area typology, characteristics, and architectural quality

The study conducted to fulfil the fourth research sub-question confirmed that waiting areas in public hospitals in Thailand and Denmark share a similar typology. In the process of answering research sub-question 2, seven types of public hospital waiting areas were identified (see section 5.2). The comparison study between Thai and Danish public hospitals (Maharaj Chiang Mai Hospital and Rigshospitalet) highlights that four types of waiting areas are shared between the hospitals, including (1) large waiting area (2) food place and cafeteria (3) waiting area located in building circulation (4) waiting area inside the clinic with a nurses' station.

Findings from this study also indicated that a waiting area located in building circulation, including waiting areas in corridors, are the most common waiting area type that was used in both hospitals. It was also found that corridor waiting areas have a negative impact on patients' waiting experience and care journey because the area is often a lack of patient comfort or privacy. Corridor waiting areas are not suitable for long waits, wheelchair-bound patients, of vulnerable groups of patients. This finding is in line with existing research on EBD (Becker & Parsons, 2007; Davidson, 2017; McCullough, 2010; Ulrich et al., 2006, 2008;) and existing research on the design of hospital waiting areas (Biddiss et al, 2013; Jiang et al., 2017).

This study provides information for hospital planners and facilities managers, showing that hospital waiting areas can be designed based on the mentioned typology. However, not every type of waiting area is suitable for every patient profile, and in particular corridor waiting areas are problematic due to their associated lack of patient comfort and privacy. The specific typology of the chosen waiting area should be carefully selected based on

patients' needs. For example, a waiting area for an orthopaedic clinic should provide room for wheelchairs or walkers for elderly patients. Different clinic types require different types of space in the waiting area.

5.4.2 Underlying issues influencing patient's waiting experience and their care journey

Existing literature related to patients' waiting experience and care journeys indicated that a positive experience and care journey depends on four factors: (1) positive attraction in the waiting areas (e.g. access to greenery, access to daylight, beverages, magazines, arts), (2) design of the waiting areas, (3) contact with nurses, and (4) hospital services (Biddiss et al., 2013; Fogarty & Cronin, 2008; Jiang et al., 2017).

The investigation of a Thai public hospital (Paper 1), the insights of which are described in section 5.1, are in alignment with the findings from this study. The comparison study of patients and medical staff from public hospitals in Thailand and Denmark yield similar results. Both groups of participants claimed that patients' waiting experiences and the patient care journey do not depend solely (or even primarily) on the four factors described in the existing literature. Both Thai and Danish patients and medical staff felt that the hospital's physical environment and the physical quality of the waiting areas are not the most important contributor to patients' positive experience. On the contrary, patients and medical staff stated that two other factors are important for this: (1) structure and organisation of healthcare system and (2) hospital management and services system.

These points are in alignment with my previous study on the Thai public hospital (see section 5.1), which reflected on the underlying issues of the Thai healthcare structure and system, where the healthcare system has an indirect impact on patient numbers. A high number of patients in the waiting areas appear to affect the patient experience and care journey the most (Paek et al., 2016). Similar to the Thai participants, Danish patients and medical staff also thought that the structure and organisation of the healthcare system has a stronger impact on their waiting experiences and care journey than do the physical environment and design of waiting areas.

This study also indicated that a hospital's management system also has an impact on patient waiting experience and care journey; as this is related to 'time and services', this finding is aligned with the literature on psychology of waiting in lines (Maister, 1985; Jones & Peppiatt, 1996). The psychology of the *waiting in lines* concept focuses on the services of a business where 'waiting time' is one of the major factors that strongly impacts people's satisfaction (Jones & Peppiatt, 1996). This concept is reflected in the paradigm shifts that have taken place in hospital design and in EBD and patient focused approach in healthcare service, where waiting time has been identified to negatively impact patients' satisfaction and their perception of care (Bleustein et al., 2014).

Findings from this study contribute to the existing but limited body of literature on hospital space management and design of non-clinical areas. Moreover, the findings also extend to what is already known about patient and medical staff needs for the design of hospital waiting areas. *New findings from this study revealed that patient waiting experience and care journey do not only depend on architectural quality of hospital and design of waiting areas but also on a holistic view of several factors, in particular the healthcare system and*

hospital management system. This study also noted that a failure of the healthcare and hospital management systems could lead to an overly high number of patients and poor quality of services, an issue already shown in the earlier investigation of a Thai public hospital and related literature study regarding the Thai public healthcare services. (Damrongplasit et al., 2009; Limwattananon et al., 2012; Suwannarach et al., 2010).

The underlying issues that have an impact on patient waiting experiences and their care journey can be illustrated in layers of core components (Figure 5-2). The fundamental layer is the healthcare system, the second layer is the healthcare management system, the third layer is patients' needs and patient-focused approach, the fourth layer is hospital space management, the fifth layer is physical environment, and the last layer is social structure and cultural setting.

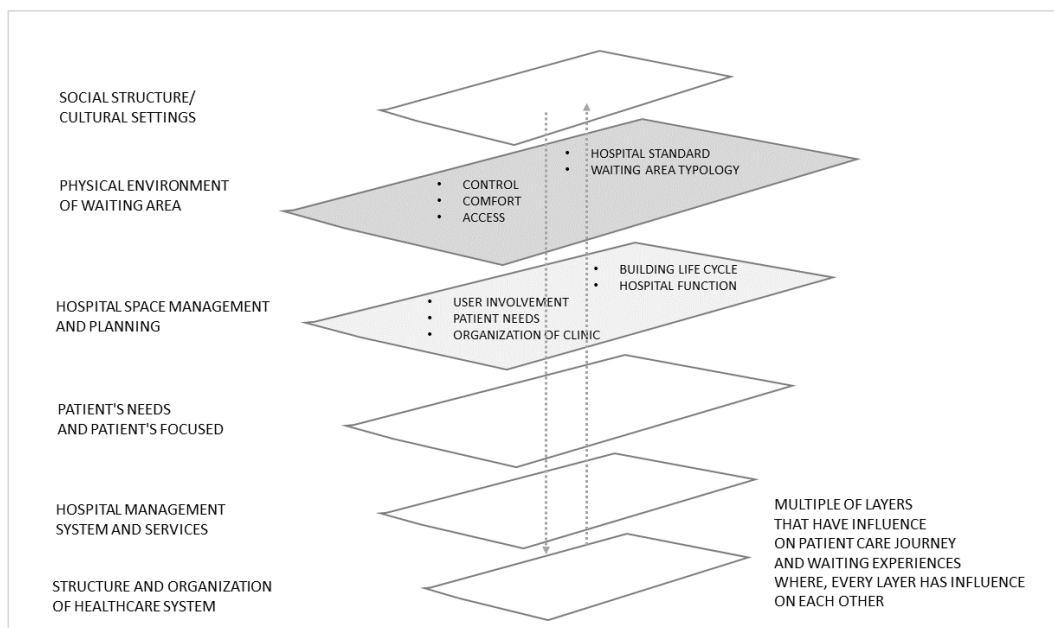


Figure 5-2: Core components that have an impact on patient waiting experience and care journey.

The fundamental layer is the structure of healthcare system, followed by hospital management system. These two factors govern the number of patients and the quality of services in public hospitals. Effective patient journey and positive waiting experience results result from well-managed and organised hospital services that integrate patients' perceptions into hospital service design. This finding is consistent with the literature on patient-focused approach, where the integration of patients' perceptions can lead to effective hospital service and patient care journey (Nenonen et al., 2008; Stickdorn & Sneider, 2012; Simonse et al., 2019).

Hospital space management and planning has less impact on patient waiting experience and care journey than healthcare system and hospital management system and services. This

component consists of five factors (user involvement, patient needs, organisation of clinic, building planning, and hospital function); this finding contributes to the existing knowledge on EBD theory, healthcare environments, and the patient stress concept, where a hospital's physical environment can have an impact on patient health and well-being (Becker et al. 2007; McCollough, 2010).

The physical environment of hospital waiting areas is considered to have minimal influence on patient waiting experiences and care journey. This component consisted of five factors (control, comfort, access, hospital standard, and waiting area typology); this new finding is aligned with the literature on patient-centred design frameworks (Leather et al., 2003; Patterson et al., 2017). Patterson et al. (2017) described that comfort, access, connection, and control are the four design components that have the most impact on patients' expectations. The new factors, waiting area typology and requirement of waiting area, which emerged during the analysis in this study can be added to the existing knowledge of hospital design and hospital waiting areas design.

Social structure and cultural setting are placed on the top layer of all the core components, as this aspect influences both users and hospital buildings. Cultural settings have an impact on the mental state of patients and medical staff and on how both groups make use of the waiting areas (Hofstede, 2011; Riratanaphong, 2014). The study of cultural settings (Paper 4 and 5) provides a better understanding for hospital planners and facilities managers of how they could approach users to better design waiting areas. This component also provides useful information that can be implemented in future designs of hospital waiting areas that can optimise patient care journeys.

5.4.3 Differences and similarities between the perceptions and experiences of patients and medical staff in Thailand and Denmark

The two countries have both similarities and differences, from the overview of the healthcare system to the perception of patients and medical staff. The topics are divided as follows:

Healthcare system: Both Thailand's and Denmark's healthcare systems employ a universal coverage scheme (Limwattananon et al., 2012; Olejaz et al., 2012); however, the two countries structure and organise their public healthcare services differently.

For Thailand, the issues regarding the structure and organisation of the healthcare system were addressed in section 5.1 (answer to sub-question 1); these included issues of (1) launching of universal coverage scheme (2) a lack of local general practitioners as gatekeepers and a lack of local health services (3) failure to decentralise public health management (4) a limited number of government hospitals. These findings disclosed the incompetency of Thai healthcare system, which leads to a mismatch of medical access and healthcare services. The failure of Thailand's healthcare system organisation has resulted in a high number of patients and overcrowded situations in public hospitals.

The study of Denmark, by contrast, revealed that Danish patients and staff are satisfied with the Danish healthcare system. This aligns with the literature on the Danish healthcare

system, which highlights the benefits of Denmark's decentralised healthcare system, which provides a clear classification of hospital and healthcare services (Ministry of Danish Health, 2017; Olejaz et al., 2012;). General practitioners (GPs) function as gatekeepers to Denmark's specialist healthcare. Every patient is assigned a specific local GP who has the sole responsibility for the patients assigned to the practice (Strandberg-Larsen et al., 2010).

Moreover, the implementation of an online health portal in Denmark allows patients to access important information using centralised patient data and provides data transparency to patients (Danish eHealth Portal, 2020). The original idea of online health platform was preliminary targeting medical staff and hospital administrators (Andersen et al., 2014). However, in 2003 the Danish government launched an eHealth service called 'Danish eHealth Portal' (Sundhed, 2020). The eHealth portal is an online health service resulting from the integration of patient-centred approach through a digital tool in which patient involvement plays important role in the development of the portal (Andersen et al., 2014; Das, Faxvaag & Svanæs, 2015). The eHealth portal enables patients to have access to their health record, as well as provides them ability to manage treatment schedule through secured online patient-portals (e-mail, ePrescriptions and eScheduling) (Koch, 2006; Das et al., 2015). The *access and manage* provided by eHealth portal is empowering patients, and this in line with the EBD theory, where patient empowerment is one of the core elements of patient-centred approach (McCullough, 2010). Furthermore, eHealth Portal could engage medical staff in working together with patients creating 'patient centred care'. Das et al., (2015) describe that communicating through the online platform can enable medical staff to individualize the care to patients' particular needs.

The literature review on the development and implementation of eHealth portal also suggested that an intensive involvement of stakeholders (medical staff and patients) through participatory design technique is required (interviews, observation, artefact, document analysis, workshops) as these techniques are key elements leading to successful implementation of the portal (Andersen et al., 2014; Das et al., 2015). The eHealth portal was tested and evaluated through end-user participatory design approach, and the Portal should be easy to use. This information is aligned with the literature review on user focus in design process emphasizing on usability evaluation, where all aspects of the users' experiences when they interact with the product, service, environment, or facilities should be considered (Alexander, 2007; Aalto et al., 2017).

Findings from this study indicated that there is a big difference between Thailand and Denmark towards technology utilization in healthcare service provision. It is obvious that Denmark is more advanced in technology utilization compared to Thailand. Thailand is still struggling with the incongruence between availability of health care resources and the need of health care treatment while Denmark has been developing and implementing technology to facilitate and optimize their healthcare services.

Healthcare management system: Thailand and Denmark employed different healthcare management systems and services.

In Thailand, the hospital management systems and services are still lacking long term management and planning; expertise and knowledge regarding hospital planning; and

appropriate screening processes for high numbers of patients. They also have limited medical staff and do not have an organised queueing system. The findings from this study indicate that most Thai patients expressed negative feelings about going to the hospital, as it is time consuming due to the slow service and lack of queueing system. This aligns with previous studies about patients' perceptions of waiting for healthcare services (Jones, et al., 1996; Maister, 1985; Norman, 2009) that show that waiting experiences at hospitals are often stressful due to the uncertainty of patients' health situation and lack of information. Therefore, it is necessary for hospitals to minimise the uncertainty of waiting times, reassure patients that they are recognised, and make clear the expected waiting times throughout their hospital visit (Canadian Nurse Association, 2009; Norman, 2009).

In contrast to Thailand, Denmark's hospitals provide patients with organised hospital services and useful information. Denmark implemented a user-focused approach during the country's healthcare reform in 2007 (Andersen, 2016; Olejaz et al., 2012). Danish hospitals provide appointment details, hospital maps, and other information via telephone text messages or e-mail (Vrangbaek, 2015). Furthermore, since 2003, Denmark has been using patient involvement as part of its national quality assurance programme, where patient needs are considered in hospital services (Vrangbaek, 2015). Rigshospitalet Design Manual and Danish eHealth portal are two examples of patient involvement approach through the development of healthcare services. Rigshospitalet Design Manual translated actual patient's needs into patient profiles, the manual is also used as part of a project to renovate hospital waiting areas.

Hospital space management and planning process: In both Thailand and Denmark, hospital buildings are outdated and the original design of hospital buildings in both countries did not include the design of waiting areas.

In Thailand, the hospital explored in this study has been through renovation, expansion, and development where a new building was added to the existing ones, creating a large complicate hospital complex. This adaptation and development of a Thai public hospital building is inconsistent with incremental development theory (Jensen, 2006; O'Mara, 1999). This investigation was already addressed in sub-question 1, where incremental development of space without structural long term planning was shown to lead to multiple space management problems and low functional quality (see section 5.1). Similar to the situation in Thailand, the Danish hospital is also facing an increasing number of patients and some waiting areas have been transformed into clinical areas.

Danish patients and medical staff described that there have been relocations and renovations in several clinics at the hospitals, and the literature on the Danish healthcare system support this findings. The Danish government allocated 8.98 billion euro for 43 hospital projects, which includes 16 new hospital building projects. Many Danish hospitals are preparing for expansion and renovation of their existing buildings; the literature supports this finding (Andersen, 2016; Olejaz et al., 2012).

This study also indicated that Thai and Danish patients and medical staff provided similar suggestions for improving patient waiting experiences and patient care journey. Three similar situations that they noted are: (1) an increased number of patients; (2) hospital

buildings are outdated; and (3) the waiting areas were not integrated into the original design of the hospital. Because both countries are facing a similar situation, the hospitals can exchange information about their space management problems and solutions to avoid making similar mistakes. This information provides the answer to the research question framed in Paper 2, that hospitals can learn from each other to improve their space management issues in non-clinical areas.

The space management requirements that were proposed by both the Thai and Danish participants were: (1) hospital functions and accreditation standards are the most important aspects of the design process, (2) user involvement should be employed during the design process but should be managed properly, (3) clear guidelines of the building life cycle should be provided. This finding was supported by existing knowledge related to patient expectations (Anåker et al., 2016; Patterson et al., 2017).

Participants from both countries also proposed similar requirements for waiting areas. Patients were more concerned about control, comfort, and hygiene during their medical journey, whereas medical staff focused more on patient safety and hospital standards. The requirements of the Thai and Danish patients and medical staff can be summarised into five core elements (Figure 5-3).

The five core elements are: (1) *Control*—patients would like to have control over their journey and waiting time, and would like to receive useful information; (2) *Hospital standards*—hygiene, cleanliness, safety, and level of noise; (3) *Access*—location of nurse's station, access to greenery, view of outside, daylight, and access to supporting facilities; (4) *Area typology*—areas where patients wait during medical processes and areas where patients wait after medical processes, and supporting facilities used as waiting areas; (5) *Comfort*—privacy, personal space, relaxed atmosphere, positive attraction, drinks, and comfort seats. This study is aligned with the design framework of physical environment and patient expectation, where a well-designed hospital has a positive impact on patients' stress levels and how they perceive their quality of care, and creates positive clinical health outcomes (Anåker et al., 2019; Arneil et al., 2002; Connellan et al., 2013; Patterson et al., 2017; Zadeh et al., 2012; Zadeh et al., 2018).

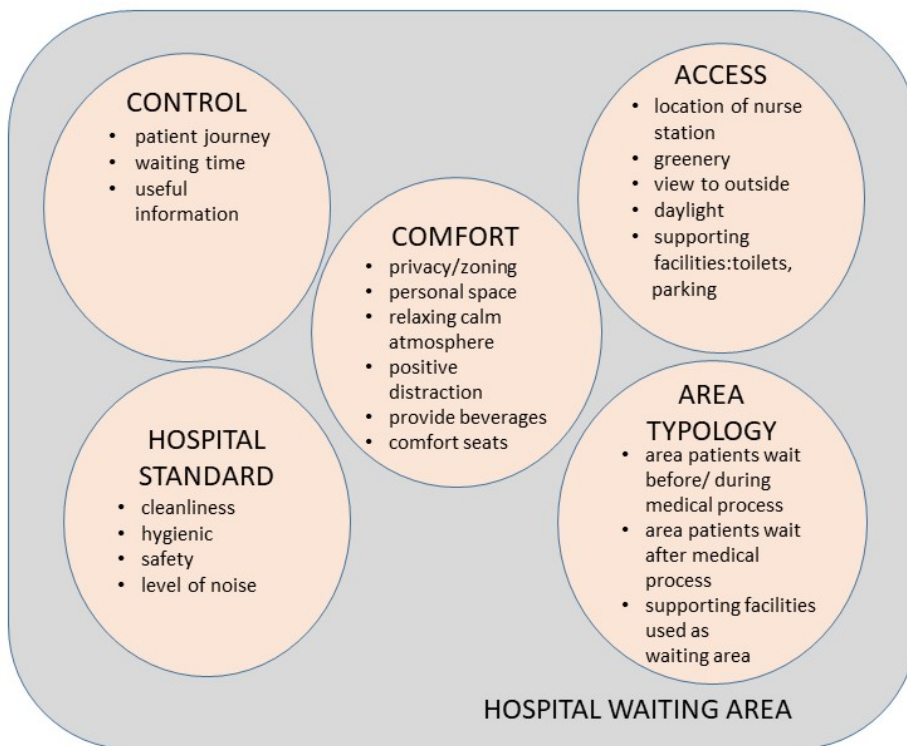


Figure 5-3: Five core elements for optimising patients' waiting experience and care journey.

Patient-focused approach from the perspective of medical staff: This study shows that both Thai and Danish medical staff had the same understanding of the patient-focused approach. Medical staff from both countries distinguished the differences between patients' needs and patient-focused concepts. They described that patients' needs comprise basic needs of a patient, which involve providing a medical treatment plan, being treated, getting better, and so on. The patient-focused approach is a concept where staff focus on each individual patient's needs, circumstances, and life situation. The concept of a patient-focused approach is aligned with existing knowledge of user-focused and EBD approaches where individual patients' context is considered (Alexander 2008, 2010; Becker et al., 2007).

Moreover, both the concepts of meeting patients' needs and patient-focused service given by medical staff are aligned with the literature study focused on patient focused integrated in patient care journey (Reay et al., 2017; Richardson et al., 2007; Simonse et al., 2019).

Social structure and cultural settings: Different mentalities and culture experienced by Thai and Danish patients and medical staff were disclosed this study. The six dimensions of national culture have been applied to this study in order to investigate the cultural differences between the Thai and Danish participants (Hofstede, 2011).

For Thailand, the study revealed two major cultural values that impact the mentality of both patients and medical staff, *collective culture* and *hierarchical culture*. Thailand is considered

to be a highly collective culture (Hofstede et al., 2010; Riratanaphong, 2014); this is shown in the study where patients were accompanied to their hospital visit by three or four family members. This is one of the major reasons that hospital waiting areas are often full or over-occupied. This collective culture also has an impact on interpersonal moral value, which is held in high regard (Mulder, 2000). The findings of this study are aligned with this theory, as Thai medical staff noted that they care for patients individually, and patients also confirmed that staff provide good service. Another value relates to hierarchy; this study showed that Thai patients were likely to accept poor physical conditions of the hospital and slow services because complaining might create conflict or lead to slower services. This finding is aligned with hierarchy and face theory (Deveney, 2005; Hofstede et al., 2010; Mulder, 2000), where offending someone in front of a group can lead to a situation of 'losing face', resulting in more conflict.

For Denmark, the study indicated some major cultural values that impact the mentality of both patients and medical staff, which are *power of sharing, trust, and participation*, and *dignity and equality*. The findings revealed that patients had good relationships with medical staff, and patients described that they could easily share their life situation and that staff understood their circumstances and adjusted treatment plans according to patients' individual situations. This is aligned with the Danish values of sharing, trust, and participation (Grenness, 2003; Hofstede, 2011). Danes also value dignity and so medical staff encouraged patients to keep up with their careers even if they were extremely ill (Church, 2017), as career and normal routine are an important part of Scandinavian life. Lastly, equality was important, which is evidenced as being an important value among Danish people through the hierarchy among Danes being rather flat (Grenness, 2013; Hofstede et al., 2010). The literature on cultural hierarchy supports this study's findings, showing that Danish patients feel they can easily discuss personal life matters with staff for consultancy and solutions (Hofstede, 2011).

To conclude and answer research sub-question 4, improving patients' waiting experience and care journey does not only mean improvements to the physical setting and the design of the waiting areas. This study revealed that there are underlying issues and fundamental problems that need to be tackled before improvements in the hospitals' physical condition will make a difference (see Figure 5-2). In fact, it appears that the healthcare system and the hospital management system are the core components that can lead to positive waiting experiences and care journeys. The physical environment and waiting areas are facilitators that provide comfort for patients while they wait (see Figure 5-2).

The participants in both Thailand and Denmark provided similar opinions and suggestions for improved public hospital physical environments; both hospitals can exchange information and learn from each other because they are dealing with similar situations.

One distinguishing feature of note is that Denmark has a much better healthcare system and healthcare management system than Thailand. In term of healthcare system, even though both countries employ the universal coverage scheme, Denmark has decentralized healthcare system as their healthcare services are equally distributed throughout the country; Thailand, on the opposite, has centralized healthcare system, where the country is struggling to provide sufficient public health services. This study also showed the big

difference in the utilization of digital technology in healthcare service between the two countries. Denmark has been implementing digital technology to facilitate and organize their healthcare services since 2003, whereas Thailand is lagging behind Denmark in term of technology utilization. This study revealed that the Danish eHealth portal is a secure online health platform that organize and centralize patient health data, allowing patients to access and manage their medical journey. The portal also automatically links patient health records between local and specialized healthcare facilities.

As to healthcare management system, the Danish government is more aware of patients' needs than the Thai government. Patient-focused and patient-centred approach has been integrated in the Danish healthcare policy, which began in 2003 through the national quality assurance program. Moreover, the Danish eHealth portal originally aiming for healthcare staff has expanded their target to patients with the implementation of patient-centred approach. Thailand, on the other hand can learn and adopt some of Denmark healthcare management approaches. Nonetheless, Thailand still need to strive to create a better public health sector.

6. CONCLUSION

In this chapter, I answer the main research questions based on the core findings I have drawn from answering the sub-questions (Chapter 5) and the five papers. Then, I discuss the contribution of the literature and practice. I end this chapter with limitations and opportunities for further research.

The purpose of this PhD study is to develop knowledge on the design of public hospital non-clinical areas, focusing on a user-focused approach. It is crucial to have knowledge regarding the context of hospitals and their end-users, which primarily involve patients and medical staff. However, only a few studies have scrutinised the design of public hospital waiting areas, and little attention has been devoted to the factors that influence waiting experiences and patient care journeys. In a previous chapter of this thesis, I answered four sub-questions, which led to the answering of my two research questions.

6.1 ANSWERING RESEARCH QUESTION 1

RQ 1: What characterises public hospital non-clinical areas?

The answers are divided into sub-sections as follows.

6.1.1 Six core components govern the characteristics of hospital non-clinical areas

This study showed that several core components determine waiting area characteristics and typology. The investigation of both a Thai (Maharaj Chiang Mai hospital) and a Danish (Rigshospitalet) hospital revealed that the characteristics of hospital waiting areas depend not only on architectural quality, waiting area design, or guidelines of hospital standards but on six core components, in particular the structure and organisation of healthcare and hospital management systems. The six core components include: (1) structure and organisation of healthcare system, (2) hospital management system and services, (3) patients' needs and patient-focused approaches, (4) hospital space management and planning, (5) physical environment of waiting area, and (6) social structure and cultural settings (see Figure 5-2). Previous studies on hospital waiting area design focused only on the requirements of the hospital's physical environment, architectural elements of waiting areas, and patient expectations (Biddiss et al., 2013; Jiang et al., 2017). This study has added new information to what hospital planners and facilities managers should consider before designing hospital waiting areas; these other important components can have a long-term impact on the design of hospital waiting areas.

Besides comprising the characteristics of public hospital waiting areas, the six core components also have an impact on patients' waiting experiences and patient care journey. Two core components, healthcare system and hospital management system, govern the number of patients in both outpatient and inpatient clinics; studies have shown that a high number of patients can lead to slow service (Paek et al., 2016), which has a negative impact on patient waiting experience and journey.

6.1.2 The implementation and impact of new paradigm of hospital design

The investigation of waiting areas in public hospitals (Papers 1, 2, and 5) has led to the development of a public hospital waiting area typology, which includes seven types of waiting areas. The seven types of waiting areas are considered a core finding for this PhD study; this adds new information to the literature on hospital waiting area design.

This study shows that most public hospital waiting areas can be categorised into seven types of waiting areas, including: (1) a large waiting area, (1a) a large waiting area without zoning, (1b) a large waiting area with zoning, (2) a long corridor waiting room with chairs along the walls, (3) a small waiting area beside a corridor, (4) waiting space next to a window, (5) an outdoor waiting area, (6) a food place and canteen, and (7) an unplanned waiting area.

Although public hospital waiting areas can be categorised into these seven types of waiting areas, the characteristics and architectural quality in each hospital can be different. For example, St Olavs and Maharaj Chiang Mai hospitals both have corridor waiting areas, but the characteristics and architectural quality of the two areas are different. These differences can stem from the implementation of EBD, HE, and user-focused approaches during the hospital design process. The implementation of these approaches can lead to high architectural quality, creating waiting areas with a welcoming and relaxing atmosphere that can contribute to positive mental health outcomes (Andrade et al., 2017; Connellan et al., 2013).

The case studies presented of two newly built hospitals, St Olavs and Khoo Teck Puat hospitals, and of recently renovated waiting areas in Rigshospitalet demonstrated that these hospitals boast high architectural quality and have certain characteristics, including large open spaces with zones, a variety of seats, floor-to-ceiling or large windows, access to daylight and an outside view, considerations of patient comfort and privacy, and choices of seats. The architectural elements are aligned with EBD and HE approaches, suggesting they offer a de-stressing effect for patients during their wait times (Leather et al., 2003; Ulrich et al., 2006). In contrast, the case studies of old hospital buildings, including Maharaj Chiang Mai hospital, Chulalongkorn hospital, and Rigshospitalet (old waiting areas), illustrated poor architectural quality, where the waiting rooms had no zones, no access to windows or daylight, a lack of privacy and comfort, and only provided one type of seat.

Therefore, it is evident that in addition to the six core components mentioned in section 6.1.1, the implementation and impact of new paradigms of hospital design (EBD, HE, user-focused approaches) can determine the characteristics of non-clinical areas in hospitals. However, the implementation of new paradigms of hospital design does not impact the number of patients in public hospitals. Therefore, optimisation of waiting area design and patient experience must involve considerations of the healthcare system and hospital management system together with the implementation of new paradigms of hospital design.

6.2 ANSWERING RESEARCH QUESTION 2

RQ 2: How can the experiences and perceptions of Thai/Danish patients and medical staff optimise the design of waiting areas, with the aim of integrating a user-focused approach?

The answers are divided into sub-sections as follows.

6.2.1 User-focused and user-involvement approaches during the design process through specific design guidelines can lead to positive design outcomes.

The purpose of integrating user-focused approaches in hospital waiting area design is to ensure optimal outcomes. The literature on user-focused approaches suggests that implementation of user involvement in the design process can lead to a higher degree of usability (Alexander, 2010; Fronczek-Munter, 2016).

The literature also suggests that user involvement can successfully transfer a user's experiences and needs into the design process (Fronczek-Munter, 2016; Jensen et al., 2011). Bate and Robert (2006) noted that users' perceptions and experience comprise first-hand knowledge, which can be useful for developing effective healthcare design.

Existing literature on use-involvement and building usability suggests that user involvement and evaluation with users should only be done when managed properly. The process should not raise incorrect expectations and should be done early in the briefing process (Fronczek-Munter, 2016). User involvement in the healthcare design process should be carried out as a co-design process where the end-users (patient or medical staff) work together with the hospital planner and facilities manager in a co-partnership, leading the design together (Bate et al., 2006).

The findings from this study show that the involvement of clinical nurses during the waiting area design process yields successful design outcomes. The architectural layout of the new area met the requirements suggested by clinical nurses. The new waiting area provided a higher number of seats, more zones, a higher level of privacy and comfort, and comfortable seats.

The user-involvement process was carried out through specific design guidelines outlined in the *Rigshospitalet Design Manual*. The design manual provided a step-by-step user-involvement approach. Moreover, the guideline served as a communication tool across different disciplines, ensuring shared understanding between designers and end-users (clinical nurses) (Broberg et al., 2011; Carlie, 2002, 2004). The manual includes details for holding cross-disciplinary meetings during the design process (clinical nurses, hospital planners, project management), as well as patient profiles representing actual Rigshospitalet patients and their needs (personas), and a furniture catalogue that met the hospital's standards. Because the furniture catalogues and outlines of the types of waiting areas were provided, the manual also accelerated the design process by eliminating unnecessary meetings.

To conclude, user involvement is a technique involving a transfer of user perceptions and experiences. In this study, implementation of this technique resulted in positive design outcomes, showing that this should be carried out with clear guidelines and managed properly. We suggest that user involvement should be carried out when the guidelines are clear and when all parties (users, hospital planners, project manager, and facilities manager) have the same understanding and expectations.

6.2.2 Differences and similarities of the six core components - information that Thai and Danish hospitals can exchange and inform each other

Our comparison study of patients and medical staff in two large public hospitals led to informative findings. This study began by investigating and evaluating building environments and later scrutinised patient and medical staff experience and perceptions. In this study, which compared Thai and Danish patients and medical staff, the six core components (mentioned in section 6.1.1) emerged during the analysis, showing that these core components can have an impact on the design of waiting areas, patient waiting experience, and patient care journey. The emergence of these core components shows that in order to achieve positive design outcomes, these core components should be considered.

These six core components can be applied to hospital strategic space management and both long-term and short-term planning. The core components comprise the information that Thai and Danish public hospitals can exchange and used to inform each other in order to optimise the design of waiting areas, including improving patient waiting experience and care journey. The six core components are described in brief as follows:

- **Healthcare system** – Local and community hospitals or healthcare services are the most important type of facility as they provide the first patient touchpoint (Nenonen et al., 2008; Simonse et al., 2019). Community hospitals are the first place where a patient comes into contact with healthcare staff to receive medical services. Therefore, GPs are a significant key, serving as healthcare ‘gatekeepers’, screening low-priority cases from those requiring large, specialised public hospitals. Public health sectors should be able to provide credible healthcare ‘gatekeepers’ who prevent overcrowded situations and slow services.

Furthermore, decentralising the healthcare system, moving from a centrally governed system to one governed by local municipalities, can lead to a more equal distribution of healthcare services and number of patients. This study also revealed that Denmark has decentralized healthcare system; however, patient health records are kept centralized through the online portal service called the Danish eHealth Portal. The strategy and concept of decentralizing healthcare service with centralized patient health data can be applied to long-term future development of Thailand healthcare system.

- **Healthcare management system** – Planning a long-term hospital management system and integrating hospital planning expertise in design team for future design of the hospital. Two important keys aspects mentioned by both patients and medical

staff in terms of healthcare management system are providing accurate patient waiting times and offering other useful information.

This study showed that high quality healthcare system is supported by well-organized healthcare management system. One strategy of the Danish healthcare management system is the implementation of technology through online health portal (the Danish eHealth portal), which provides data transparency for patients. The portal enables patients an access to their health records and manage their medical journey through secure government website (Sundhed.dk), without having to go to the hospital. Moreover, the portal provides the opportunity for medical staff to follow-up and respond to patient questions beside a traditional face-to-face visit (Das et al., 2015). Patient-focused approach was also integrated during the development of the eHealth portal. Therefore, it is clear that patient centred approach can be integrated in all kind of healthcare services - from policy to technology strategy.

The three components of healthcare management system, which include (1) integrating hospital planning expertise in design team for long term hospital planning, (2) providing patient accurate waiting time and offering useful information (3) utilizing technology to centralize patient health records providing patients secured but transparency access should be prioritised. More organized healthcare system and lower number of patient in public hospitals could be a result from the implementation of the three approaches.

- **Hospital space management and planning** – This study shows that both the studied public hospitals in Thailand and Denmark are facing a similar situation, where the number of patients is increasing and medical buildings are becoming outdated and obsolete. Moreover, the design of the waiting areas was not integrated into the original design of the hospital. The study pinpointed that hospital planners and facilities managers should consider that: (1) hospital function and hospital accreditation standards are the most important aspects in the design process, (2) user involvement should be employed during the design process (mentioned in previous sub-section); however, the involvement of users should be balanced between functionality, practicality, patient profiles, and patient needs, and (3) providing clear guidelines for a building's life-cycle.
- **Physical environment of waiting area** – The literature focusing on the design of hospitals' physical environments and waiting areas (Forgarty et al., 2008; Pati et al., 2011) had already suggested several components that can lead to positive patient health outcomes. This study added one new aspect, which is a waiting area typology that hospital designers, facilities managers, and planners can consider during the design process.
- **Patient needs and patient-focused approaches** – Implementation of user involvement in the early hospital briefing is extremely important. However, user involvement during the design process should be carried out through good management and structured guidelines. Our study shows that medical staff can

clearly distinguish between the concepts of meeting patients' needs and being patient-focused. Furthermore, they can provide insights that may be overlooked by hospital planners or facilities managers. Different phases of involvement of different user groups are also recommended, this means that patients and medical staff can be involved in different phases of the design brief (Fronczek-Munter, 2016).

- **Social structure and cultural settings** – This study provides information that hospital planners, designers, and facilities management should consider during the design brief or future space management and planning. Cultural settings influence how users behave and interact in the buildings and, as shown in the study, Thailand and Denmark have different cultural values. For example, Thailand is a highly collectivist culture, whereas Denmark is an individualist culture (Hofstede, 2011); therefore, waiting spaces in Thailand might be larger and more flexible than in Denmark to accommodate larger groups accompanying patients to visits, or supporting facilities could be integrated into waiting spaces for long waits.

6.3 CONTRIBUTION TO THE LITERATURE

This PhD study contributes to the literature frameworks that I have been reviewing throughout my entire study. Five topics of existing knowledge that my PhD thesis contributed to are healthcare system, building evaluation and assessment techniques, new paradigms of hospital design, user-focused and usability approaches, and the patient care journey.

According to my research on healthcare systems, there has never been a comparative study conducted between Thai and Danish healthcare systems or Thai and Danish hospitals. The existing literature on the Thai healthcare system mostly focuses on the implementation of its universal coverage scheme and the impact of the universal coverage scheme on healthcare utilisation among Thai citizens (Limwattananon et al., 2007, 2011, 2012; Paek et al., 2017). The recent literature on Danish healthcare focuses mainly on the healthcare reform that was launched in 2007, which involved merging and decentralising public hospitals and allocating large amounts of budgets for renovating and building new hospital projects (Andersen, 2016; Olejaz et al., 2012). This study compared both countries' healthcare systems in one major aspect – how the healthcare system and public health services are organised. This study showed that comparing healthcare systems in two completely different contexts (Yin, 2014) is possible and can yield relevant outcomes. Moreover, this study provides an overview of information comparing how each of these countries structures their healthcare system. The findings can be applied as a guideline for future studies that compare healthcare systems in two different continents or between Southeast Asia and Scandinavia.

The study also contributes to the literature on the strategic adaptation of space (Jensen, 2006; O'Mara, 1999). This study has extended the discussion regarding incremental space development by revealing space management problems that occur in large public hospital buildings; for example, large hospital buildings that expand through an incremental space development approach might lead to long-term space management problems.

Furthermore, during the evaluation of the Maharaj Chiang Mai hospital, I have combined two evaluation methods, which were clinic design post-occupancy evaluation (The Center of Health Design, 2015) and evaluation criteria for building functional quality (Van der Voordt & Van Wegen, 2006), and I developed building evaluation criteria and requirements for healthcare facilities. These evaluation guidelines can be used for future research or studies that focus on space management problems in non-clinical areas of public hospitals and which evaluate hospitals' non-clinical areas. The guidelines can be further developed into a more specific guideline that focuses only on hospital non-clinical areas and waiting areas. Nonetheless, during the analysis of the space management problems in Maharaj Chiang Mai hospital, I applied an architectural analysis technique called 'Analytical drawing technique for design assessment' (Van der Zwart et al., 2015). Findings from the analysis provided clear guidelines on how to apply the analysis technique to architectural plan drawings.

During the investigation of both my primary and secondary case studies (the five public hospitals), I have developed a public hospital waiting area typology and this study contributes to the literature on healthcare architecture (waiting area design) and patient health outcomes (An ker, 2019; Andrade et al., 2017; Patterson et al., 2017; Zadeh et al., 2018). The findings can be used in future studies concerning the typology of public hospital waiting areas and their impact on patient health outcomes. Moreover, this typology can be used as a guideline to further investigate which types of waiting areas are suitable for various specialised clinics.

The comparison between Thai and Danish patients and medical staff also filled the research gap identified earlier in this PhD study and contributed to the literature on new paradigms of hospital design. Due to the limited body of literature focusing on the relationship between waiting areas, patient waiting experiences, and patient care journey, the findings of this study extended the focus towards these topics.

Moreover, the study contributes to the literature on user-focused design and space usability. The study confirmed the credibility of previous studies that found that a high level of usability can be created when environmental context, culture, and user experience are integrated into the design process (Alexander, 2008, 2010; Fronczek-Munter, 2016).

Lastly, this study contributes to the literature on patient care journeys. The existing literature notes that the best way to improve a patient's journey is to integrate their experience into service design (Nenonen et al., 2008; Simonse et al., 2019; Stephen et al., 2017). This study confirms that patient journey and patient waiting experiences can be optimised through the consideration of patient journey. Moreover, several components, including healthcare system, hospital management system, patients' needs, patient-focused approach, hospital space management and planning, design of waiting areas, and cultural settings also have an influence on positive patient care journey.

6.4 CONTRIBUTION TO PRACTICE

Research that focuses on improving public hospital waiting areas and integrating a user-focused approach during the design process comprises a fairly new area. This PhD thesis

provides additional practical tools and propositions, which are divided into four sub-categories as follows.

6.4.1 Structure and organisation of healthcare system

This study revealed differences in the healthcare systems of Thailand and Denmark. The comparison study pinpointed that the Thailand healthcare system needs to be reformed to be able to tackle its high patient numbers. Moreover, Thai hospital management systems should be able to provide more useful information. In Denmark, the healthcare and hospital management systems are relatively organised because the country has a decentralised healthcare system and centralised patient medical information. Denmark is also preparing for increased patient numbers in the future by expanding healthcare facilities. Based on this comparison study, Thailand can consider a long-term healthcare reform plan. First, the country needs to decentralise its healthcare system and implement a better screening system that involves GPs as gatekeepers. Second, centralised patient medical records are needed to allow hospitals to synchronise patient information and provide specific medical treatments. Denmark can also make improvements to its healthcare system by expanding hospital and healthcare facilities to treat higher patient numbers and facilitate the development of medical treatment technologies.

6.4.2 Healthcare evaluation guidelines

This study provided healthcare facilities and hospital evaluation guidelines that focus on the functional quality of hospitals' non-clinical areas (see Paper 1 – table 1). The guidelines provide evaluation criteria together with details for implementation. Hospital planners, facilities managers, or anyone who would like to evaluate hospitals' non-clinical areas can use these guidelines together with the Rigshospitalet waiting area evaluation guidelines (table 2-2 - Chapter 2). Both guidelines are easy to apply and can lead to reliable data.

6.4.3 User involvement during the design process

The study that involved clinical nurses during the design process (Paper 3) provided clear guidelines on how to arrange and organise user involvement during the design process. This approach can be handled through several techniques, including meetings and interviews (see table 2-3 – Chapter 2). However, it is recommended that user involvement should be carried out when well-managed and where all parties have the same understanding and expectations. In this PhD study I used the *Rigshospitalet Design Manual*, which provided guidelines for a user-involvement approach and provided useful information to end-users (clinical nurses), including Rigshospitalet patient profiles (personas), waiting area types, furniture catalogue, and brief agendas for cross-disciplinary meetings.

This design manual can be applied to future development and used as guidelines for the user-involvement process in Thai hospitals, as its application to this study of user involvement resulted in positive design outcomes. Hospital planners, facilities managers, and end-users can get an overview of the design process through this design manual, which is an improvement over old-fashioned design processes, where everything comes in piecemeal. Therefore, it is recommended that Thailand apply this approach and issue

standardised regulations stating that hospitals must involve users in their development, briefings, and strategy planning for the design of both clinical and non-clinical areas. Comments from staff and patients must be taken seriously in further development of hospitals. Denmark can further develop the process of user involvement by further involving users with diverse cultural backgrounds in the hospital development and design process.

6.4.4 Hospital space planning and design of waiting areas

This study showed that successful and efficient long-term space management and strategic planning requires collaboration between different stakeholders (clients, users, end-users) and knowledge from experts (project managers, hospital planners, facilities managers, designers). This information is aligned with literature on usability briefing in hospital design (Fronczek-Munter, 2016). However, as mentioned in section 6.4.3, a specific guideline like *Rigshospitalet's Design Manual* should be applied to structure the process of user involvement and provide the same understanding and expectations among users and experts.

I also recommend the implementation of systematic planning to collect useful data for future space planning and managing. The collected data includes records of patient profiles, numbers of patients and visitors in each clinic, and patients' needs and behaviour. This data can be included for the Thai public hospital space management plan and also to create a Thai-specific hospital design guideline. This study also provides a waiting area typology with seven types of waiting areas, which can inform the future design of public hospital waiting areas. In addition, the five core elements (control, comfort, hospital standard, access, area typology) can be used together with the waiting area typology to achieve optimal design outcomes and positive patient waiting experiences. It is also important to note that waiting area in a hospital is often the first and the last space visited by patients. Hospital waiting area could be the first service touch point providing first impression that effect patient's experiences. Therefore, the design of waiting areas should not only concern the physical environment of waiting space itself. Patient waiting experience also depends on coming to the space and leaving the space. Hence, the criteria of reachability and accessibility including navigation and wayfinding are essential to consider in space planning of patient journeys.

Lastly, the study of cultural differences between Thai and Danish participants can be used to develop Thai patients' profile (personas) (Nielsen, 2013) as well as new Danish patients' profiles that can be added to the design manual for future design of hospital waiting areas.

6.5 LIMITATIONS AND OPPORTUNITY FOR FURTHER RESEARCH

Although, this PhD study is certainly not free from limitations, it offers a valuable basis to outline an opportunity for future research on the design of public hospital non-clinical areas through user-focused approach. Here, I list the limitations found during the study and later suggest opportunities for further research.

This study was mainly built on qualitative investigation of case studies, meetings and interviews with participants from primary case studies. Although, qualitative study is

appropriate approach to investigate the issue of interest in depth, it constrains the generalization of the results (mentioned in 3.5.3 generalizability) (Leung, 2009; Yin, 2014).

During the observations of five hospitals (two primary and three secondary case studies) the time spent on the observations was relatively short. For the Bangkok and Singapore cases, which were two of my secondary case studies (Chulalongkorn and Khoo Teck Puat hospitals), the observation period was only one week, due to budget and time constraints. Further research is needed to scrutinise the relationship between patients and waiting spaces, where the observation focuses specifically on how the hospital waiting spaces are being used by patients.

The user-involvement study was conducted through an actual design project. The took place in one clinic, involving only two meetings (ultrasound clinic) due to ethical permissions and language barriers. Later, only six nurses were recruited for the interviews according to the limits of ethical permissions. Therefore, the study sample is small and the data might not represent all the processes and outcomes of every end-user-involved design project (Leung, 2015; Saunders et al., 2019). Moreover, the findings only represented the user-involvement process, nurse perceptions, and experiences at Rigshospitalet Denmark. Further research is also needed that explores additional user-involvement hospital projects and compares different design projects. Such findings could provide information that can be more easily generalised. In addition, more interviews with clinical nurses who were involved in the design process should be given.

In the comparison of primary case studies, I only had the opportunity to thoroughly investigate two cases – Maharaj Chiang Mai hospital and Rigshospitalet – due to the difficulties getting ethical permissions. Although the study yields several informative findings, further study is still required. Further research on additional large public hospitals in Thailand and Denmark that are facing similar situations – buildings that are outdated, in need of expansion, or obsolete – is recommended. More included case studies could lead to more precise and credible findings.

The interviews with patients and medical staff in Thailand/Denmark also had two major limitations; some other the limitations regarding the interview study were addressed in Chapter 3.

First, the study sample is small ($n=38$), which includes 21 patients and 17 medical staff, so the participants may not be representative of all patients and medical staff in large public hospitals. The study participants only represent the experiences, opinions, and perceptions of patients and medical staff at Maharaj Chiang Mai hospital and Rigshospitalet. Even though the results are sufficient to identify and prioritise factors that influence patient waiting experiences, the data are insufficient to draw clear cause-and-effect relationships among each of the core components. This suggested that more groups of people should be recruited for further study, which includes;

(1) People, who are involved in public health policy including strategy and planning unit, design and construction organization. Information obtain from the investigation could

provide more understanding on the relationship among the core components that influence patient journey and waiting experience.

(2) People, who are accompanying patients to the hospital (patient's family, patient's care taker). Some of them might spend more time in the waiting areas than patients themselves. Information obtain from this investigation could lead to more insights towards patient care journey and waiting experiences. Furthermore, analysis data could result in development of design manual and expansion of patient profile

(3) People, who are involved in waiting area as service providers (food and beverage provider) to obtain data for the development for the use of waiting space.

Additionally, a larger population of patients and clinical staff from more case studies (large public hospitals) should be recruited for further study to gain more data to clearly identify the relationships between the themes that emerged and the six core components. More data could reveal different solutions and offer clear guidelines that would further improve the Thai healthcare system and the design of public hospital waiting areas. This study finding also showed that Thai citizen prefer to go to large public hospital rather than community hospitals; further study on health-seeking behaviour in Thailand is also recommended.

Second, the study participants were identified as willing to participate by the head nurses of the clinics at both hospitals due to requirements of ethical approvals. Similar to participating patients, the chosen medical staff were also those identified as willing to give interviews. This situation could create potential for selection bias (Keil & Edwards, 2019). Third Thailand and Denmark have different economic systems, social gaps, and cultural values (Grenness, 2003; Hofstede, 2011), which can have significant influences on healthcare resources and management of the healthcare system; social gap and different social values can have a significant impact on the mentality of both patients and staff (Hofstede, 2011; Riratanaphong, 2014).

Findings from the interviews indicated useful information about the arrangement of the countries' healthcare and hospital management systems, hospital space management, and waiting area design that both countries could use for future healthcare development to improve patient waiting experiences. Similar comparisons between other countries are recommended for further studies. As mentioned earlier, I suggested a further comparison study between Thailand and other South East Asian countries or Denmark with other Scandinavian countries.

Furthermore, interviews from this study also revealed the utilization of technology can facilitate the organization of healthcare system and healthcare management system. The Danish government launched the eHealth portal that centralize patient medical records through secured government website. Based on this study finding, the portal was successfully implemented, where patient-focused approach was integrated in the development of the portal. This PhD study only touched slightly on the implementation of technology in healthcare service. More research is needed for further investigation on the trend of digitalization including online health portal (eHealth portal) on *what* are the impact

of online technology towards users' experiences. Furthermore, the comparison between countries on the utilization of technology in healthcare services should also be investigated. Thus, the comparison should be conducted in countries that share similar technology advancement and healthcare context.

This study also revealed the benefit of user-involvement in the design process through the involvement of clinical nurses, this suggested opportunity for further investigation on enhancing user-involvement in hospital design process through the utilization of technology. Moreover, there has been a rise in literature focusing on the use of building information technology (BIT) including building models (BIM) on the development and design of hospital in the past ten years (Chellappa, 2009; Lin et al., 2018), which was not in the focus of my PhD study. However, it could be interesting to further investigation the use of BIT and BIM in the design process of public hospital waiting areas.

Although, this PhD study yields insights towards factors that influence patient journey and their waiting experiences as well as discloses underlying issue effecting current condition of Thai public hospital non-clinical area, I find that qualitative approach that I chose is limiting the novelty of my study to only a descriptive level. The combination of quantitative and qualitative methods could lead to more strengthened findings. Therefore, further research is needed focusing on the impact of design proposal with a combination of quantitative and qualitative studies. The investigation of quantitative approach focusing on financial cost allocate for hospital project together with pre- and post- evaluation questionnaire survey among a broad range of users (patient, people who accompany patients and medical staff) should be conducted. Moreover, quantitative investigation can be combined with qualitative approach based on individual and focus group interviews and participatory design techniques (interviews, observation, artefact, document analysis, workshops).

6.6 REFLECTIONS ON PANDEMIC SITUATION AND DESING OF PUBLIC HOSPITAL WAITING AREAS.

The COVID-19 (Corona virus disease -2019) pandemic outbreak has had an extremely strong effect on the entire world, causing severe damage to both healthcare and economic sectors. It is undeniable that hospitals are going through a massive adjustment due to the outbreak, as many were not prepared for this unprecedented situation. To prevent overwhelming healthcare services and slow down the spread of the virus and to save lives, a new term, *social distancing*, has become the new norm and has been legitimately applied to the entire world population.

During the current outbreak of COVID-19, well-prepared healthcare facilities are at the centre of an effective response. Hospitals should be able to adapt swiftly to the increase in demands while continuing to ensure safe environments for patients and healthcare workers (WHO, 2020b). Without a doubt, hospital waiting areas also needed to be adapted to ensure patients' safety and, at the same time, allow them to follow the social distancing rules. In this way, my PhD topic is directly related to the current outbreak of COVID-19, and therefore I have some suggestions that can be implemented in the design of hospital waiting areas during and after the pandemic outbreak. The suggestions are: first, hospitals should provide separate entrances and separate waiting zones for low-risk patients,

intermediate-risk patients, and high-risk patients (immunocompromised patients). Second, hospital management systems should support the use of an online registration system that provides accurate appointment times and approximate waiting times for patients. This can prevent a high number of patients in hospital waiting areas and encourage rapid discharge of patients. This suggestion was already mentioned in the discussion chapter, as hospital management systems should provide useful information to patients and accurate waiting times. Lastly, hospitals should organise the physical environment to focus on infection control. A new norm should be instituted, involving rules applied to everyone who enters hospitals, where wearing infection protection (surgical mask, face mask, face shield, and gloves) is mandatory. Moreover, handwashing sinks and hand-gel dispensers should be located in every waiting area and in any conspicuous locations. These suggestions can easily be applied to prevent infection among patients and medical staff during and after the pandemic outbreak.

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Appendix 1

Paper 1

IDENTIFICATION OF SPACE MANAGEMENT PROBLEMS IN PUBLIC HOSPITALS: THE CASE OF MAHARAJ CHIANG MAI HOSPITAL

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Abstract:

Purpose: In the last decades, public hospitals in Thailand have developed gradually and been characterized by an incremental development of the hospital facilities. Firstly, this study investigates the factors that have caused the incremental development and how such development has affected the hospital's architectural layout. Secondly, the paper assesses the functional quality of nonclinical areas in the Maharaj Hospital to identify space management problems.

Design/methodology/approach: The first part of the study is based on a literature review of the Thai healthcare landscape. The second part includes the functional quality assessment of nonclinical areas, walk-through observations, and documentation. Obtained data were synthesis using building quality method and measurement criteria and analytical drawing techniques for design assessment.

Findings: The first part identified three factors: (1) the lack of local general practitioners, (2) the limited number of public hospitals, and (3) the implementation of Thailand's universal coverage scheme. These factors have resulted in a dramatically high number of patients in public hospitals. The second part identified problems regarding (1) poor accessibility, (2) a low level of spatial flexibility, and (3) poor spatial orientation. These problems are related to a lack of appropriate strategic space planning and lack of integration of the Thai culture into hospital design processes.

Practical implication: An identification of space management problems is a prerequisite to the improvement of hospital facilities.

Originality/value: This paper presents the first study of space management problems concerning nonclinical areas in Asian hospitals.

KEYWORDS: Thai public hospital, building assessment, functional quality, space management, patient journey.

1. INTRODUCTION

The development of the hospital landscape, medical treatments, and hospital architecture in Thailand is strongly influenced by Western countries (Jungsateansup, 2016; Muangman, 1987; Seangwichean, 1988). This influence began in the early nineteenth century and the influence has continued until the contemporary period. Today, Thailand provides public and private hospitals; both are under the authorization of the Ministry of Public Health.

Changes in demography, legislation, and technology have impacted awareness of the importance of the healthcare industry throughout the world (Zengul & O'Connor, 2013). The Thai government spent 2,865 billion Baht (7 billion Euros) on healthcare infrastructure between 2016 and 2018 (Thailand Bureau of Budget, 2015), and 302 billion Baht will be applied on planning and administration of hospital and health center operations (Thailand Bureau of Budget, 2018).

Interest regarding hospital design has been raised due to a paradigm shift in healthcare service, where patients are seen as end-user (Ferguson, 2002). The focus of hospital design has transitioned from building functions to user friendliness, especially patient and staff needs (Becker & Parsons, 2007). Hamilton (2003) believes that design decisions based on information available from research is the best way to improve hospital clinical outcomes, economic performance, productivity, customer satisfaction, and cultural measure.

This paper presents the results of a literature review of the Thai healthcare landscape and fieldwork observation at the Maharaj Hospital Chiang Mai, Thailand. This review unveils problems with the current situation concerning functional quality in Thai hospitals. The results from assessing the current physical settings of the Maharaj Hospital and the study of how the Thai healthcare system is framed provide a deeper understanding of government hospital functional quality.

This study investigates the functional quality of nonclinical areas the Maharaj Hospital (major public hospital in Thailand). Nonclinical areas are the areas of a hospital that do not relate to, involve, or are concerned with the direct observation and treatment of living patients. Nonclinical areas include waiting areas, parking lots, restaurants, shops, cafés, hallways, staircases, elevators, etc.

The analysis of the data identifies specific problems regarding space management of hospital nonclinical facilities.

2. RESEARCH OBJECTIVE

The aim of this study is to gain a better understanding of Thailand's healthcare system and how the service of Thai primary healthcare and the public healthcare system are organized. An investigation was conducted to identify problems in relation to functional quality in the Thai public hospitals, using walk-through observation representing patients' journeys. This paper intends to contribute to further research on which hospital design approaches can be implemented in Thai public hospitals and how facilities planners, designers, and other related professionals can collaborate and improve their functional quality. Therefore, this paper explores the following research question:

What space management problems can be identified in Chiang Mai Government hospital in relation to functional quality of the nonclinical area?

3. BACKGROUND

The background of this study is categorized into three sections: hospital building assessment and space management strategy concept. The hospital building assessment identifies criteria for evaluation processes. The space management strategy identifies the strategy planning and development of the hospital space for long-term adaptation. The Analytical drawing techniques for design assessment identifies the tool that we used to analyze the relationship between users and functional quality.

3.1 Building assessment for hospital

Hospital architectural quality can be evaluated with many different evaluation methods (Fronczek-Munter, 2017). In this study, we chose three building assessment approaches that are widely used to evaluate hospitals and healthcare facilities: Evidence Based Design (EBD), A Guide to Clinic Design Post-Occupancy Evaluation Toolkit (The Center for Health Design, 2015), and Building Quality Assessment Method and Measurement.

3.1.1 Evidence Based Design

Evidence Based Design (EBD) is a “process for the conscious, explicit, and judicious use of current best evidence from research and practice in making critical decisions, together with an informed client, about the design of each individual and unique project” (Hamilton & Watkins, 2009 cited in Zengul & O’connor, 2013). The EBD concept was first presented in a publication by Roger Ulrich in Science (Ulrich, 1984) with the self-explanatory title “A view through a window may influence recovery from surgery”. There are more than 700 scientific studies providing evidence that a hospital’s physical environment can promote better clinical outcomes, increase safety, and reduces stress for both patients and staff (Ulrich *et al.*, 2004).

This approach is a dynamic process which can be applied to many types of healthcare facilities. EBD seeks the best concrete information in order to make a decision. It is a reciprocal and collaborative process that includes both the EBD team and the client who wants to utilize EBD for the construction of a new healthcare facility or the renovation of an existing one.

3.1.2 Post-Occupancy Evaluation

Evaluation and feedback are key components for continuous improvement of the built environment (Center for Health Design, 2015). Post-Occupancy Evaluation (POE) is one of the most known building assessment methods among building inspectors and planners. According to the definition of Preiser *et al.* (Preiser *et al.*, 1988; Preiser, 1989; Preiser, 1995), POE is “the process of evaluating buildings in systematic and rigorous manner after they have been building and occupied for some time.” As the assessment of functional quality in hospitals is complex, triangulation and multi-methods of evaluation are required (Lindahl *et al.*, 2012). Research has shown that hospital projects use various evaluation methods for several reasons (Fronczek-Munter, 2013, 2017). Recent research by Deuble & de Dear (2014) sees POE as “one of the suite of tools to measure building performance and should be used in conjunction with other methods to evaluate all aspects of a building, including the social, psychological, and physical.” They suggest a combination of building performance data and satisfaction ratings to achieve a valid and reliable evaluation of the building. In 2011, the Center for Health Design (CHD) introduced a precise guideline for POE to evaluate hospital buildings, called “Clinic Design POE” (Center for Health Design, 2015).

Clinic Design POE

In recent years, there has been unprecedented growth in community health center (CHC) renovation and construction (Center of Health Design, 2015). The CHD has recognized the importance of clinic design in improving healthcare outcomes and been eager to create a knowledge resource around clinic design. Therefore, in 2011, the CHD developed a standardized Clinic Design Post-Occupancy

Evaluation toolkit. The guidelines are intended to be general directions and can be adapted to any hospital project. The CHD defines the conceptual framework of Clinic Design POE as “the evaluation tool that focuses on how the environment design supports the achievement of organizational goals relevant to this particular facility.” During the design process, these organizational goals are translated into a set of specific designs/design features, and the decisions lead to a set of environmental conditions (e.g., lighting level, window views of nature) presented in the building after construction. The environment conditions impact healthcare outcomes (e.g., patient satisfaction) after occupancy. The POE results are then used to confirm whether the design intents have been realized and to adjust organizational goals for future renovation or construction. Figure 1 illustrates the conceptual framework of the Clinic Design POE.

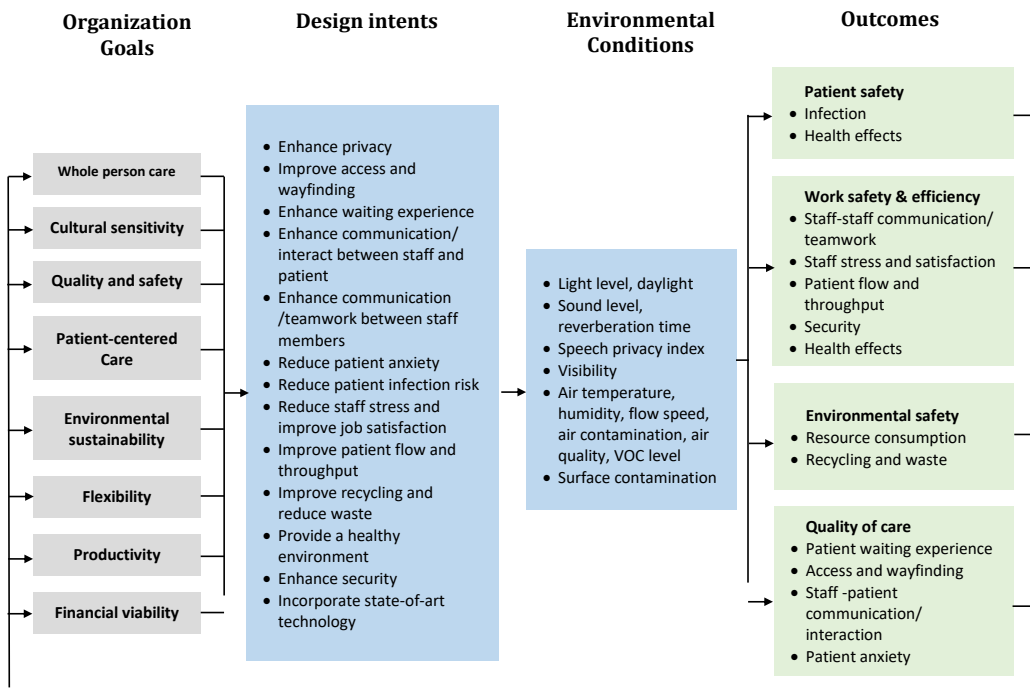


Figure 1: Conceptual framework of clinic design POE (available at: <https://www.healthdesign.org/insights-solutions/clinic-design-post-occupancy-evaluation-toolkit-pdf-version>. Accessed 25 August 2018)

A precise data collection process is included in the Clinic Design POE—a toolkit with five tools for collecting a variety of data on the physical environment, subjective perception of users, and objective healthcare outcome. The following is brief description of each tool:

Tool 1—General Information, Organizational Goals & Design Principle: This tool is used to collect general information on organization and focuses on the organization goals, which lead to the design principle.

Tool 2—Audit of Physical Environment: This tool is intended for an interdisciplinary team including a facility manager or another individual who is familiar with the facility design operation as well as designers and selected frontline staff members. The auditors may bring an evaluation sheet and a digital camera. The auditors will walk through various spaces such as the parking lot, waiting areas,

patient-clinician interaction space, and staff workspace. Each auditor independently verifies whether each design feature is implemented and how well it meets one or more criteria listed in the tool. In addition, photos of each type of space should be taken according to the photo checklists included in the tool. After completion of the evaluation, auditors assess the data to determine the quality of the architectural function of each area. Photo and floor plans rigorous the evaluation results.

Tool 3 —Patient Questionnaire: This tool is used to gather patient perceptions of the clinic environment and service quality.

Tool 4—Staff Questionnaire: This tool is focused on staff perceptions of the environmental design and work experience.

Tool 5—Outcome Data Collection Form: This tool is intended to facilitate the data collection on outcomes related to the selected goals and design intents. For example, a rating scale form or self-completion questionnaire.

The criteria set in the Clinic Design POE framework has been developed from data obtained by the Evidence Based Design approach. The requirements for the hospital physical environment, both in Clinic Design POE and EBD share similarities; however, the Clinic Design POE has precise evaluation criteria.

3.1.3 Building Quality Assessment Method and Measurement

Several parameters of the physical environment can be implemented in the evaluation process. This study aims to identify the functional quality of the existing hospital and present preliminary findings. Therefore, we integrated the Clinic Design POE framework with the criteria for functional quality created by Van der Voordt & Van Wegen (2005) as tools to assess the Maharaj Hospital building. The Clinic Design POE provides standard criteria with a clear method of obtaining data. A building quality assessment provides clear criteria for building function evaluations.

Van der Voordt *et al.* (2005) described the concept of functional quality as a building that is suitable for the activities for which it was intended. The people inside the building must be able to function efficiently, comfortably, healthily, and safely. Van der Voordt *et al.* (2005) provide nine aspects for functional evaluation: (1) reachability, (2) accessibility, (3) efficiency, (4) flexibility, (5) safety, (6) spatial orientation, (7) privacy, (8) health and physical well-being, and (9) sustainability. According to Huisman *et al.* (2012) aspects (1) through (8) can have direct effects on patient and staff health and well-being. In Table 1, these 8 aspects are further defined based on Van der Voordt *et al.* (2005). Table 1 describes the criteria for the assessment of healthcare facilities with precise details. Healthcare facilities may include hospitals, clinics, outpatient care centers, and specialized care centers such as birthing centers, nursing homes, and psychiatric centers. Whereas the World Health Organization (2018) defines hospitals as health care institutions that have organized medical and professional staff, inpatient facilities, and deliver services 24 hours per day, 7 days per week. They offer a varying range of acute, convalescent, and terminal care services using diagnostic and curative tools.

Table 1: Evaluation aspects and requirement for healthcare facilities (Van der Voordt, 2005)

Aspect	Requirement
Reachability	- Reachability by goods vehicles, private cars, and public transportation
Accessibility	- Minimum requirement for corridor width that will not restrict the egress in the event of emergency evacuation (International Health Facilities Guideline, 2015) (1) patient corridor; inpatient units, operating units, intensive care unit minimum clear corridor widths of 2450 mm (2) staff only corridor (with no patient traffic) corridor may have a clear width of 1200 mm and length must not be greater than 12 meters (3) public corridor; interdepartmental corridor is 2450 mm and public corridor should not be less than 1600 mm
Efficiency	- Favorable location provides suitable routes for people and good arriving and departing - Adequate access arrangements for the building - An efficient layout such as sort walking distances, clear hierarchy between public and private space - Sufficient floor area to allow the desired activities to be carried out - Sufficient vertical dimension (care unit 3000 mm, corridor and public passage 2700 mm) (International Health Facilities Guideline, 2015) - Functional use of color and materials to support spatial orientation, reconcilability, and identity
Flexibility	- Easily adjusted to suit changing circumstances, which means buildings should be easy to adapt without having to do much in the way of breaking down walls and without incurring high costs. - Plan for development of services 7- 15 years and spaces 3 – 30 years - Spatial flexibility must ensure that the organization continues to have satisfactory accommodation available in the event of change of its primary activities or method of working
Safety	- User safety includes safety accessible rooms, safe passageways, avoidance of sharp edge and corners, safe stairways, handrails and banisters appropriately installed, non-slip and level floor finished, unsafe place screened off, sufficient illumination, avoidance of loose leads, functional-specific measures e.g. separate sections between infection waste and normal waste
Spatial orientation	- Clear overall shapes and easily understandable access routes - Clear distinction between public, semi-public, and private spaces - Map of the areas should be provided for easy identify the direction and wayfinding - Color and lighting should be implementing in coordination with wayfinding, and specific areas - Use of ornament or material to identify different locations and directions - Directional sign should be available at or before every major intersection, major destination - Signs should be placed every 4.6 – 7.6 m if there are no key decision points along a route - Information desk or information points at the entrance of wards or clinics
Privacy	- Clear separation between consultant rooms and examination rooms - A clear distinction between non-clinical area, staff area, and clinical wards - Separate entrance and route between each area - No direct connection between non-clinical areas and clinical ward
Health and physical well-being	- Light: (1) provide windows for access to natural daylight in patient rooms along with provisions for controlling glare and temperature (Joseph, 2006) (2) the amount of light (for general-use rooms such as waiting rooms, corridors, day rooms) - Noise: the maximum recommendation for noise level in hospital is 30-45 dB (for general-use rooms) (Cunha and Silva, 2015)

We use the requirements mentioned in Table 1 to evaluate the functional quality of the Maharaj Hospital. The criteria that we focus on during the evaluation are efficiency, flexibility, and spatial orientation, because these three criteria indicate the functional quality of the nonclinical area.

3.2 Space management strategy

Major decisions regarding space management in most western companies are usually made every 3 to 5 years (O'Mara, 1999, cited in Jensen, 2006). The decision is made when new building projects are initiated, buildings are going to be bought or sold, or major rental arrangements started or ended. In these situations, the importance of space decisions is obvious, because they can have serious long-term consequences on the company's economy and potential to develop with numerous side effects on staff and collaborative partners. According to Jensen (2006), space management strategy does not get much attention from the board of top management committees; space is usually just taken for granted.

3.2.1 Strategic adaptation of space

One of the most important aspects of space strategy is to ensure that long-term adaptations of space fit a company's need for development. Space strategies enable competitive advantages by supplying the right resources with economical, wise decision making. There are three generic space strategies based on the space development analysis of American companies: incremental, standardized, and value-based (Becker & Steele, 1995; Jensen 2006; O'Mara, 1999).

An incremental strategy means that adaptations of space are made only in small steps when absolutely necessary, and extra space is usually rented to avoid major capital investments. This strategy is mainly applied by companies with uncertain situations. It is a typical strategy for new companies during the start-up stage, where the demand for the company's product is unpredictable. This strategy can also be applied by companies under fast growth, where acquiring extra space rapidly has high priority.

A standardized strategy means that both designs and decisions on space are strongly regulated and based on strict long-term plans. This strategy is mainly applied by well-consolidated companies with a high degree of certainty concerning their future development.

A value-based strategy means that the symbols and values of the organization play a key role in decisions on space. This strategy is mainly applied by companies with medium uncertainty. This is typically companies that use building projects to promote their position both by creating optimal physical frames for production processes and by utilizing the buildings as a symbol in relation to the surrounding world.

3.3 Analytical drawing techniques for design assessment

To achieve optimum solutions in building assessments, spatial or floor plan analysis is considered one of the most reliable methods; it can give precise information about how the building is being used. Architects, facility planners, and project managers employ the integration of POE and functional floor plan analysis to obtain insights and create optimized design guidelines (Van der Voordt *et al.* 1997). One of the standardized methods commonly used by planners and designers for design assessment is called Space Syntax (Van der Zwart & Van der Voordt, 2015). Bill Hillier and his colleagues from University College London developed the Space Syntax approach as a tool to define people's patterns of movement and interactions within a building. The movements of people within a building's spatial arrangement create geometry and a network typology of spatial patterns in the built environment (Hillier & Hanson, 1984; Hillier & Iida, 2005 cited in Van der Zwart *et al.* 2015). Space Syntax contains several tools that can be used to assess building design for optimized design

guidelines. In this study, we adopted two Space Syntax tools, functional floorplan analysis and spatial configuration analysis, to analyze the relationship between users and a building's spatial arrangement.

3.3.1 Functional floorplan analysis

In functional floor plan analysis, the floor plan is analyzed in terms of functional, purposeful attention. Usually, the functions are made visible in the floor plans by using a code of colors. When applying functional floor plan analysis, important building elements such as building fabric, structural system, the color and finishes of furniture, and installations are usually omitted. On the other hand, floor plans provide essential information on the most permanent part of the buildings: the shell and structural grid. Furthermore, architectural floor plans embody the social nature of the building, through which it localizes people and modulates their interaction (Van Hoogdalem et al., 1985; Van der Voordt et al., 1997 cited in Van de Zwart, 2015).

3.3.2 Spatial configuration analysis

This method is used to analyze the relationship between users and specific spaces in the building. As people move within a building while performing their role-defined tasks, the configuration of the circulation network and the location of specific functional spaces within the network (the origins and destinations) generates a pattern of movement. When analyzing the building using this method, all the interior spaces and their adjacent relationships to other spaces are reduced to justified maps of dots and connection lines (van der Zwart, 2014). These maps are generated by designating each room as a circle with lines radiating from it to signify access points. The circle and lines are then rearranged to reveal how many particular rooms are removed from a starting point, usually the entrance. These maps enable the analysis and comparison of the social interactions between spaces (Hillier & Hanson, 1984).

4. METHODOLOGY

This study combines different methods, which includes a literature review regarding the general context of the Thai healthcare system and the selected methodologies of building assessments for hospital (Clinic Design POE), space management strategies, and analytical drawing techniques for design assessment. We have crated the methodology employed in the study (figure 2).

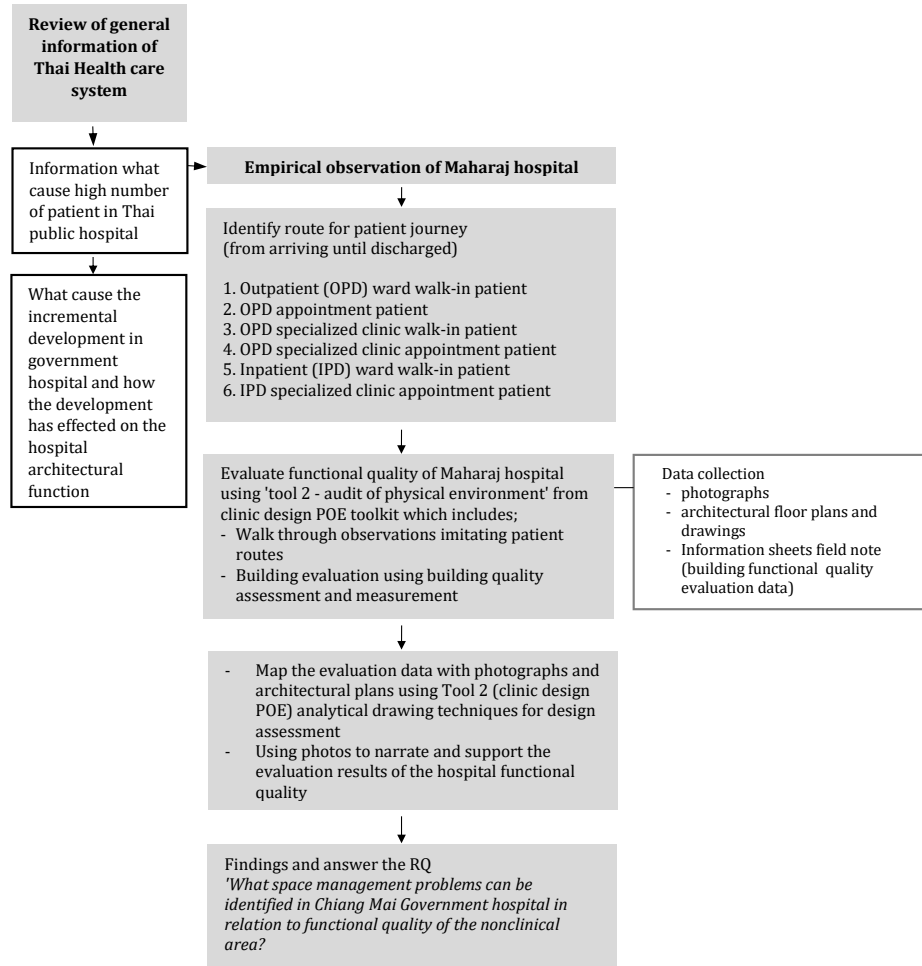


Figure 2: Flowchart of the methodologies implemented in this study

We divided the methodologies applied in this study into five steps, as follows:

- Review of Thai healthcare system—this part gives an overview of the Thai healthcare landscape, and how the system has impacted the design of the hospital and its organization.
- Empirical observation of the Maharaj Chiang Mai Hospital—we identified the typical patient journey and routes. In this step, we selected only the most common routes when patients come to the hospital which are (1) outpatient (OPD) ward walk-in patient (2) OPD by appointment patient (3) OPD specialized clinic walk-in patient (4) OPD specialized clinic

appointment patient (5) Inpatient (IPD) ward walk-in patient (6) IPD specialized clinical appointment patient.

- Imitate patient routes—in this step, we employed “Tool 2” (Audit of Physical Environment) of the Clinic Design POE to obtain data regarding the functional quality of the Maharaj Hospital. For this part, we conducted six walk-through observation routes imitating patient routes and assessed the functional quality of the building using “hospital functional quality assessment.”
- Data analysis—we synthesized all of the obtained data from both the literature review and empirical observations. We mapped the evaluation results from walk-through observations (imitating patient routes) into the architectural floor plans of the Maharaj Hospital. We employed the functional floorplan analysis and spatial configuration techniques to see the relationship between hospital spaces and their users (patients and visitors). The analytical drawing technique gives an overview of the connection between users and each area. We supported the evaluation results with analytical drawing techniques for precise and rigorous findings.
- Findings and conclusions—we concluded our study by answering research question we had set.

5. REVIEW OF THE GENERAL CONTEXT OF THAI HEALTHCARE LANDSCAPE

According to our literature review of the general Thai healthcare landscape, high patient volume is the main factor that has impacted the architectural layout and function of Thai government hospitals. Three main factors of this are listed as follows:

5.1 *The lack of local general practitioners and poor primary care services*

Primary healthcare services in rural districts of the country are provided by small local healthcare centers. However, the acceptability of local healthcare centers as the first line is poor when compared with the competing hospital-based services; all hospitals (from community to large) provide all services, including primary care, which is also available at local health centers (Guinea *et al.*, 2015; Pongpirul *et al.*, 2009; Prakongsai *et al.*, 2009; Satayavongthip *et al.*, 2016). Moreover, the Ministry of Public Health in Thailand has not launched strict regulations that obligate every citizen to go to a local healthcare center for primary care services (Ministry of Public Health, 2016). Therefore, people prefer to go to government hospitals where the medical expenses are fully covered by the government’s universal coverage welfare and social security services scheme (Satayavongthip *et al.*, 2016).

Furthermore, people in Thailand have a strong belief that tertiary referral hospitals can perform better treatments. According to Srivanichakorn & Van Dormael (1998), doctors attending the outpatient department of community hospitals, 230 out of 442 cases (52%) could have been treated at a local healthcare center. Thus, public hospitals are overloaded with patients. The daily routine in public hospitals is often chaotic, and hospital services are inefficient due to the overwhelming number of patients (Pongpirul *et al.*, 2009). In the healthcare network, local healthcare centers and general practitioners (GPs) are the first approach, before patients reach any hospital (Singh and Lillrank, 2018). Therefore, the lack of GPs and poor services of local healthcare centers has a significant impact on the high number of patients in public hospitals; anyone can directly go to any hospital.

5.2 *Limited number of government hospital*

Major hospitals are usually situated in the cities (monocentric location). There are 202 government hospitals; however, 78 hospitals are located in Central Thailand, and 60 of these hospitals are based in Bangkok (Ministry of Public Health, 2016). Nonetheless, there are only 8 main hospitals in Chiang Mai, the second-largest city, and less in small cities and suburban areas. The ratio between number

of hospitals and its patients is 1:320,000 from the total Thai population of 65.9 million (Thai Statistic Bureau, 2016). People from rural districts commute into the cities in order to visit hospitals; this is another reason why public hospitals are always overcrowded.

5.3 The implementation of Thailand's universal coverage scheme

The Thai universal coverage scheme (UCS) was introduced in 2002 and has had a direct impact on healthcare access among Thai citizens. The scheme has given the Thais easy access to healthcare services and changed health-seeking behavior (Peak *et al.*, 2016). The number of patients has increased, especially the number of low-income, vulnerable, and female patients. This has created two major problems: accessibility (such as a long waiting queue or transportation; hospital wards that are overloaded with patients) and acceptability (low-quality services and dissatisfaction) (Limwattananon *et al.*, 2011; Damrongplasit & Melnick, 2009; Limwattananon *et al.*, 2012; Peak *et al.*, 2016).

Summary

Three factors constitute the general context of the Thailand healthcare landscape, which includes the financing and structure of government hospitals, and healthcare services provided by the Thai government. This has caused an imbalance between the number of hospitals and patients. Easy access to government hospitals has resulted in overcrowded patient wards; as a result, government and public hospitals are expanding rapidly. This rapid growth has caused an incremental development of hospital buildings.

6. FINDINGS FROM EMPIRICAL STUDIES AT THE MAHARAJ HOSPITAL

6.1 General information on the Maharaj Chiang Mai hospital

The Maharaj Chiang Mai hospital was established in 1956 as Chiang Mai University teaching hospital and promoted to Chiang Mai regional hospital in 1959. The first main building of the hospital was constructed in 1972, and it is still in use as a main medical building for the whole hospital compound (Maharaj Hospital, 2017). The hospital has expanded throughout the years. Today, there are five main medical buildings: Boonsom Martin, built 1972, eight floors; Tawan, built 1975, six floors; Sujinno, built 1984 fifteen floors; Sriphat, built 1994, fifteen floors; and Charempabaramee, built 2006, fifteen floors.

6.2 Current state of Maharaj hospital

The Maharaj Hospital is the largest hospital in the Northern region of Thailand. This hospital is an affiliation between the Ministry of Public Health and the Faculty of Medicine at Chiang Mai University as part of the teaching hospital (Maharaj Hospital, 2018). It is a 1,400-bed hospital providing primary, secondary, and referral treatments. The hospital compound contains several types of buildings, including five main medical buildings.

The hospital's facilities have been developed and remodeled several times to adjust to the present state of medical function, services, and number of patients. Long-term development of spaces in the Maharaj Hospital illustrates the "incrementalism space adaptation strategy". The hospital has expanded from a total approximate area of 2,325 to 200,000 square meters in the past sixty years. The hospital developed an incrementalism space strategy as a "quick-fix" for the use of space. One major reason why the Maharaj Hospital rapidly expanded is a constantly high number of patients. In the year 2017, there were approximately 1.3 million patients in the outpatient departments and 48,000 in the inpatient department (Maharaj Hospital, 2018). Therefore, the daily situation of the hospital is always chaotic and overcrowded.

Waroonkul & Jenjapoon (2016) did an evaluation study regarding the healing environment of the hospital's medical wards. The evaluation results, which examined assessments from patients and visitors of the medical ward, were poor. The spatial layout criteria received the lowest evaluation score (rated as poor), especially (1) unclear signs designating paths and (2) long distances between medical wards.




This study aims to investigate the actual situation of this Thai public hospital. Walk-through observations imitating patient routes were conducted to evaluate the functional quality of the Maharaj Hospital and identify problems in relation to space management. Precise data regarding functional quality can be obtained from the six walk-throughs, representing patients' daily routes (from arriving until discharge) that were conducted.

6.3 Results from functional assessment of the Maharaj Hospital

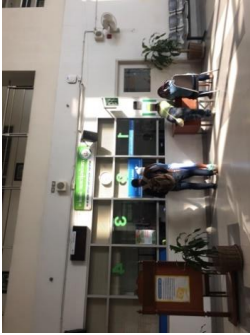

This section provides the synthesis of data collection using Clinic Design POE, photographs, and analytical drawing technique approaches. All photographs illustrated in table 2 were taken by the researcher, Supuck Prugsiganont. The results yield in-depth information regarding the spatial arrangement of nonclinical areas and medical wards. The focus of the walk-through observations is to assess the architecture quality of an incrementalism-focused hospital. Table 2 illustrates these results





Table 2: Results from a functional quality assessment conducted by six walk-through observations at the Maharaj Chiang Mai Hospital



Route	Results	Photographs
1 Outpatient (OPD) ward walk-in patient	<p>Reachability</p> <ul style="list-style-type: none"> - Long walking distance from a parking building - Majority of patients need to walk 15 minutes from parking to clinic <p>Accessibility</p> <ul style="list-style-type: none"> - Confusing route where patient must walk past the radiology ward and laboratory to reach outpatient registering areas - Parts of outpatient corridor are used for display of medical advertisements and storage for beds, wheelchairs, etc. <p>Efficiency</p> <ul style="list-style-type: none"> - Inefficient, as there is no clear designation between medical wards and public routes <p>Flexibility</p> <ul style="list-style-type: none"> - Overlapping areas between the medical wards and public routes <p>Safety</p> <ul style="list-style-type: none"> - Low in safety, as there are public entrances and routes in radiology ward and laboratory <p>Spatial orientation</p> <ul style="list-style-type: none"> - No clear sign or location information of the outpatient department ward - Signage placed every 20- 40 meters - No map nor clear signs from drop-off point to the outpatient ward - Long walking distance from parking space to the ward (1 km walking distance) - No zoning provided in waiting areas <p>Privacy</p> <ul style="list-style-type: none"> - No clear separation between public and patient zones - Low level of privacy because of crossing circulation between radiology ward, laboratory, and public route <p>Health and well-being</p> <ul style="list-style-type: none"> - Noisy due to the cross circulation of public routes in medical wards 	  <p>Figures 3 and 4: Long walkway canopy from parking building to the hospital; public route passes radiology ward</p>  <p>Figure 5: the main hospital waiting areas without zoning but with role of seats</p>

2	OPD appointment patient	<p>Reachability</p> <ul style="list-style-type: none">- Both walk-in and appointment patients take same routes to the outpatient wards- Long walking distance from parking building- Majority of patients need to walk 15 minutes from parking to clinic <p>Accessibility</p> <ul style="list-style-type: none">- No information on ward location in the hospital appointment letter <p>Efficiency</p> <ul style="list-style-type: none">- Patients are obligated to walk pass the radiology, laboratory, and orthopedic clinic before reaching the outpatient department <p>Flexibility</p> <ul style="list-style-type: none">- Overlapping areas between public and patient zones <p>Safety</p> <ul style="list-style-type: none">- Low in safety as there are public entrances and routes in radiology ward and laboratory <p>Spatial orientation</p> <ul style="list-style-type: none">- No clear sign for information center location- No clear sign for clinic location <p>Privacy</p> <ul style="list-style-type: none">- No clear separation between public and patients zone- Low level of privacy because of crossing circulation between radiology ward, laboratory, and public route <p>Health and well-being</p> <ul style="list-style-type: none">- Noisy due to crossing circulation between clinical and public zones	 <p>Figure 6: Intersection of main corridor without any signage</p>
3	OPD specialized clinic walk-in patient	<p>Reachability</p> <ul style="list-style-type: none">- Long walking distance from car parking building to the ward- Majority of patients need to walk 15 minutes from parking to clinic <p>Accessibility</p> <ul style="list-style-type: none">- Lack of hospital map providing the overall hospital layout and location of information area and clinics- Lack of clear signage indicating location of clinic as the clinics are located in four different buildings <p>Efficiency</p>	 

Figures 7 and 8: main intersection without clear signs or maps for way-finding

<ul style="list-style-type: none">- Inefficient, as there is no clear designation between public and private areas (visitors obliged to walk pass clinical ward corridor to reach OPD ward) <p>Flexibility</p> <ul style="list-style-type: none">- Polyclinics located in four different medical buildings due to the incremental development of the hospital. Therefore, the location of the clinics in the new the buildings must correlate to the location of the clinic in the old buildings. For example, OPD surgery is located on the 2nd floor of the new building due to the location of the main operating theater (located on the 2nd floor of the old building). This has affected the location of more common wards such as OPD internal medicine (higher number of patients) as the ward is located in higher floor. <p>Safety</p> <ul style="list-style-type: none">- Patients share elevators with toxic waste <p>Spatial orientation</p> <ul style="list-style-type: none">- Information center located far from the main entrance; many unnecessary signs were installed instead of signage for way-finding- Lack of map and signage at the main entrance of the building and main intersection, resulted in confusing way-finding- No signage to the ward, only signage at the polyclinics entrances <p>Privacy</p> <ul style="list-style-type: none">- Low level of privacy due to the overlapping area between medical ward and public routes <p>Health and well-being</p> <ul style="list-style-type: none">- Noisy due to the crossing circulation between public and private zone	  <p>Figures 9 and 10: registration areas far from main entrance and too many signs in front of specialized clinic</p>
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<p>4 OPD specialized clinic with appointment patient</p> <p>Reachability</p> <ul style="list-style-type: none"> - Long walking distance from the parking building to the ward <p>Efficiency</p> <ul style="list-style-type: none"> - Crossing circulation due to the location of the new clinics that have to correlate to location of ward in old buildings <p>Flexibility</p> <ul style="list-style-type: none"> - The expansion or modification of the clinics is difficult due to the connection between the wards of old and new buildings. <p>Accessibility</p> <ul style="list-style-type: none"> - Same as regular OPD ward; the OPD specialized ward does not inform patients of the location of the wards. Map of the hospital is not given to patients - Majority of patients need to walk 15 minutes from parking to clinic <p>Spatial orientation</p> <ul style="list-style-type: none"> - There is no information desk for OPD specialized with appointment patients. Therefore, patients both walk-in and with appointment walk the same routes. <p>Privacy</p> <ul style="list-style-type: none"> - Lack of privacy due to the crossing circulation between public and private zone <p>Health and well-being</p> <ul style="list-style-type: none"> - Noisy due to the crossing circulation between public and private zone 	  <p>Figure 11 and 12: One of patient elevators is used to transport toxic waste</p>
<p>5 Inpatient (IPD) ward walk-in patient</p> <p>Reachability</p> <ul style="list-style-type: none"> - Long walking distant from parking building to the wards <p>Accessibility</p> <ul style="list-style-type: none"> - corridors are blocked as part of corridor used for storage and nurse station <p>Efficiency</p> <ul style="list-style-type: none"> - No map provided the location of each clinic <p>Flexibility</p> <ul style="list-style-type: none"> - The area of the wards has been modified for several times - Storage rooms are used as patient rooms and corridors used as storage and nurse station <p>Safety</p>	 

<ul style="list-style-type: none"> - No screening process or information desk; therefore, everyone can enter the ward - Infection garbage and patients using same elevator - Nurse station located in an open space corridor; everyone can access confidential patient and hospital information <p>Spatial orientation:</p> <ul style="list-style-type: none"> - Doctors decide if patients require admission; patient walk same route as OPD walk-in patients until the registering process for room. Then patients walk or are wheeled into the wards, located in four different medical buildings. - Lack of signage or map giving direction to wards - Overlapping areas where nurse station and storage are located in the corridors - Ward does not provide waiting areas for visitors <p>Privacy</p> <ul style="list-style-type: none"> - Low privacy with multiple-bed patient rooms - No partition between each bed <p>Health and well-being</p> <ul style="list-style-type: none"> - Noisy - No air condition and not enough opening to create cross ventilation 	<p>Figures 13 and 14: Nurse station and storage in the corridor; crowded patient room without partition</p>  <p>Figure 15: Nurse station and storage located in ward corridor</p>
<p>6 IPD specialized clinic appointment patient</p> <p>Reachability</p> <ul style="list-style-type: none"> - Long walking distance between parking building and the clinic <p>Accessibility</p> <ul style="list-style-type: none"> - Corridors are used as nurse station and storage <p>Efficiency</p> <ul style="list-style-type: none"> - Lack of map giving information of information area, wards, and clinics <p>Flexibility</p> <ul style="list-style-type: none"> - Spaces in clinics are difficult to modify or expand due to the connection of the areas in between old and new buildings <p>Safety</p> <ul style="list-style-type: none"> - Low privacy due to crossing circulation <p>Spatial orientation</p> <ul style="list-style-type: none"> - Patients walk the same route as OPD walk-in patients until the registering process for room. Then patients walk or are wheeled into the wards located in four different medical buildings. - Lack of signage or map giving direction to wards 	 <p>Figure 16: Family of patients waiting to visit the patient without any waiting zone providing</p>

<ul style="list-style-type: none">- Overlapping areas where nurse station and storages are located in the corridors- Some wards (for example, pediatric OPD) do not provide waiting areas for visitors <p>Privacy</p> <ul style="list-style-type: none">- Low privacy due to crossing circulation and unclear hierarchy of public and private space. For example, nurse station located in the corridor <p>Health and physical well-being</p> <ul style="list-style-type: none">- Noisy- No air-conditioning and lack of opening and window to create cross ventilation	
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6.4 Analysis of the walk-through observations

We obtained concrete data about the functional quality of nonclinical areas in the Maharaj Hospital by conducting walk-through observations imitating patient routes. We later analyzed the data using the evaluation guidelines for healthcare facilities together with the analytical drawing techniques for design assessment. We drew the architectural drawings, and mapped the analyzed data with photographs of the areas and the analytical drawing to provide convincing evidence of the quality of nonclinical areas function. Figure 19 illustrates the functional floor plan analysis; we colored the public circulation areas with yellow and mapped patient routes to the hospital functions.

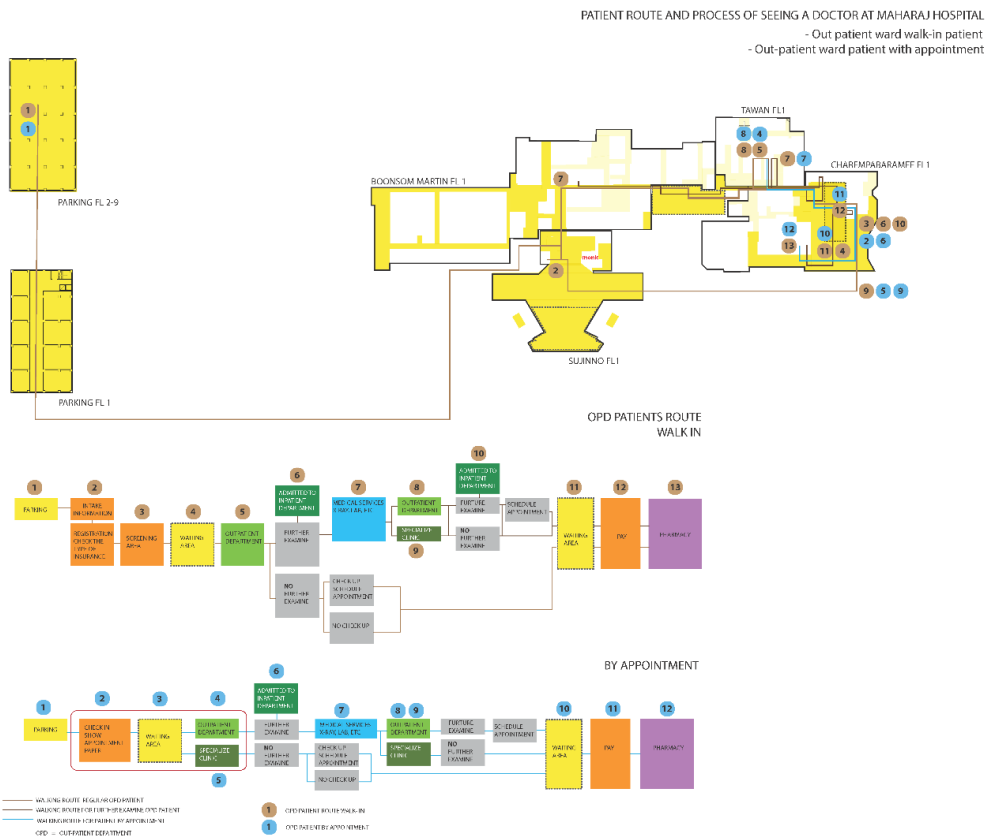


Figure 17: functional floor plan analysis (above) and spatial configuration analysis of the Maharaj Hospital imitating outpatient route (bottom); the functional plan analysis illustrates the use of the hospital spaces where we colored the function and circulation areas in the architectural floor plan. The spatial configuration analysis indicates which area patients first arrive, we connected each area with simplify lines and we applied circle label to indicate the sequence of space which (which area patient first arrive according to medical processes). Drawing and medical processes graphic created by Supuck Prugsiganont.

We applied the spatial configurational analysis as we mapped the sequence of the areas following patient routes and medical processes (which area patients first arrive in and which area is next). Both of these analysis tools lead us to the discussion of common problems regarding the functional quality of the Maharaj Hospital (Table 3).

Table 3: common problems of functional quality in the nonclinical area of the Maharaj Hospital

Topic	Common problems
Reachability	- Long walking distance from parking building to the clinics - Patients have to walk more than 15 minutes from parking to clinic
Accessibility	- Crossing circulation as visitors and patients have to walk past the clinics to reach the waiting areas - Corridors are used to keep wheelchairs, beds, or medical supplies
Efficiency	- No clear designation between method wards and public routes - Lack of map providing the location of wards or clinics
Flexibility	- Areas are difficult to adapt or modify because the relocation of wards must correlate to the location of medical wards between old and new buildings
Safety	- Crossing circulation between clinic and public areas
Spatial orientation	- No clear sign or information of clinics locations or to facilities; for example, toilets, restaurants, and shops - Far distance between each signage (20 to 40 meters) - Overlapping areas as nurse stations are located on patient corridors - Corridors are used as storage spaces
Privacy	- Low privacy because of crossing circulation and overlapping areas
Health and well-being	- Noisy due to crossing circulation between clinic and public zones - Lack of air-conditioning - Lack of opening for cross ventilation

The common functional quality problems at the Maharaj Hospital relate to low quality of building function. Most of the problems fall below minimum requirement criteria for healthcare facilities. The majority of the problems refer to three topics: (1) poor accessibility due to long walking distance between wards and facilities; (2) low level of spatial flexibility because the hospital has been remodeled several times without an overall plan for the layout; (3) poor spatial orientation due to the lack of distinction between public and private spaces, lack of clear signage, poor way-finding, lack of zoning in hospital nonclinical area, crossing circulation, and overlapping areas. When taken thorough the analysis of the problems regarding poor functional quality, two main factors are considered as being cause of the functional problems on the large scale of Thai public hospitals.

Lack of integration of Thai culture in hospital design and architecture

Alexander (2008, 2010) and Fronczek-Munter *et al.* (2011, 2016) stated that a building is usable when the context, culture, and experience are integrated into its design. The design of the hospitals in Thailand are influenced by Western design principles (Seangwichean, 1988). Cultural context is often neglected during the design process; the lack of cultural integration is obvious. As a collective culture (Hofstede, 2011; Riratanaphong & Van de Voordt, 2015), Thais usually visit hospitals accompanied by family and friends for social support. However, most of the hospital's nonclinical areas do not support long waiting hours and user activities besides waiting. According to the walk-through observations, the spatial arrangement of the hospital is not organized according to the behavior of users. Many nonclinical areas are provided without understanding the flexibility of the areas. For example, waiting areas at the Maharaj Hospital can be used only as areas for patients to wait without providing zones for other activities such as, eating, reading, or private discussing. Ulrich *et al.* (2006) suggested that areas which encourage social support can increase positive clinical

outcomes. Waiting areas in Thai public hospitals are not considered an element in the patient healing process; therefore, many waiting areas neglect to provide any more than seating.

Lack of appropriate strategic space planning that fits the Thai healthcare system

Most government hospitals are large scale or university hospitals. In the past twenty years, government hospitals have expanded over time due to a high number of patients. The first medical building of the Maharaj Hospital was constructed in the 70's; within thirty years, the hospital has expanded incrementally, resulting in five medical buildings. The strategic adaptation of space in the Maharaj Hospital is being made in small steps, when necessary. The incremental adaptation of space is being chosen to avoid a major capital investment and remodeling of the hospital. Each hospital building is being added bit by bit without considering the overall architectural lay-out. Each medical building of the Maharaj Hospital is being added every ten years. According to the strategic adaptation method, long-term planning is obligated to cover a 30-year architectural layout plan (O'Mara, 1999, cited in Jensen, 2006). Post-occupancy evaluation and building assessment for functional quality is neglected when the buildings are finished; the research and evaluation results are not being taken seriously. Waroonkun *et al.* (2016) have done evaluations on the architectural quality of the Maharaj Hospital, however, the evaluation results have pointed out that serious action has not been taken due to economically issue and bureaucratic process.

7. DISCUSSION AND CONCLUSION

This study aims to investigate and assess the functional quality of Thai public hospitals using the Maharaj Hospital as a case study. A literature review of the general context of the Thai healthcare landscape reveals the current situation of the Thai healthcare system. Selected methods for empirical observation, including; Clinic Design POE (building functional evaluation and walk-through observations imitating patient journey) and analytical drawing techniques for design assessment, were conducted to analyze and underpin real situations that patients have to face during their journey. The walks were also used to evaluate the functional quality of the hospital using healthcare evaluation criteria. We framed one main research question in our investigation of the hospital: *What space management problems can be identified in Chiang Mai Government hospital in relation to functional quality of nonclinical area?* The incremental development of Thai public hospitals was a major reason; the development of the Thai healthcare system has caused a dramatically high number of patients in government hospitals. This development has affected an incremental development in the hospital architectural layout. Walk-through observations illustrate the functional quality of the Maharaj Hospital, which represents large-scale public hospitals in Thailand. Poor functional quality of the hospital is an effect of two factors: (1) lack of integration of Thai culture in hospital design and architecture, and (2) lack of appropriate strategic space planning that fits the Thai healthcare system. The incremental development of the hospital is not the cause of poor architectural quality but poor strategic management of hospital spaces that cause specific problems.

8. FURTHER RESEARCH

This study provides credible evidence for policy makers of the Thai government hospitals. The results indicate that the functional quality of large-scale Thai public government hospitals is poor. The incremental development could lead to poor functional quality and, therefore, a change during the hospital design brief processes should be considered. The influence of western hospital design should be integrated to local context and the culture of the Thai hospital. Moreover, the design of the hospital should fit with the healthcare system of each country; the Maharaj Hospital design does not fit with the high number of patients.

This paper is the foundation of an investigation into space management and the use of space in public hospitals in Thailand. Findings from this study will set up a scope for an in-depth explorative investigation in nonclinical areas public hospitals. The further study will focus on spatial orientation and the implementation of cultural context in hospital design. The information could, additionally, be used as a precedent case study for hospital planning in neighboring developing country such as Burma, Cambodian, Vietnam, and Laos, as these countries share a similar cultural context.

A continuation of this empirical study will be conducted to compare the architectural layout, architecture quality, cultural context, and the use of spaces with several nonclinical areas of public hospitals in St Olavs, Norway; Rigshospitalet, Denmark; Chulalongkorn, Thailand; and Khoo Teck Puat, Singapore. The outcome of the generic recommendation of improvement for hospital spatial orientation focuses on the influence of cultural context; what can each hospital learn from each other? The core of further investigation is to understand in-depth the relationship between hospital design and the implementation of local cultural context.

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Appendix 2

Paper 2

HOSPITAL ARCHITECTURE QUALITY -EXPLORATORY OBSERVATION ON THREE CONTINENTS

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Abstract

Aim: This study is an investigation of non-clinical areas in hospital case studies in multiple locations in Europe (Norway, Denmark, UK), Asia (Thailand, Singapore) and North-America (Canada). The purpose is to explore the similarities and differences in spatial arrangement and the use of them. Architectural quality, usability and cultural context are investigated regarding the design and use of the non-clinical areas of the hospital because the areas are commonly used by patients and relatives. The aim is to examine whether a building assessment method could determine and explain the connection between people and the use of non-clinical areas in the different cultural contexts. How local culture influence the use, social interaction and the Usability and Architectural quality of the non-clinical areas of the hospital.

Methodology: This study is conducted as a walk-through evaluation, collection and documentation of first observation impressions at multiple hospital locations worldwide, with focus on concepts of Usability and Architectural quality. Further analysis methods include semantic differential scheme evaluation and narrative mapping with architectural drawings. The generic model and local sensitivity in each specific context are described with the use of culture and cross-cultural behaviour theories. Finally, phenomena that occur in specific non-clinical areas of the hospitals are explained with the implementation of Pattern Language concept.

Results and discussion:

This evaluation of hospital non-clinical areas in multiple cultural contexts gives fundamental understanding of the influence of culture and well-being of patients to the design of hospitals and perceived quality and usability of architecture. Even though the hospitals are located on different continents, they share similarities as the specific types of use in the non-clinical spaces. The significant similarity in the use of those non-clinical spaces correlate with the usability concept where users and their satisfaction are the most important aspects of design and architecture quality of hospital buildings. The results from the multiple case studies form the discussions to what are the current universal typologies that form high quality hospital architecture.

Keywords: walk-through evaluation, hospital architecture, non-clinical areas

1. Introduction

Hospitals are a matter of interest in most societies. This paper presents the results of exploratory observation of hospital architectural quality on three continents in order to map the quality of architecture together with the cultural differences and propose universal typologies of hospital non-clinical spaces, where architecture can promote health and well-being.

Hospital architectural design concepts have evolved rapidly since the beginning of the twentieth century. The ideal hospital was designed upon the concept where care facilities followed the needs of hospital functions (Singh & Biswas, 2018). Nowadays due to the raise of patient focused trends the concept 'design follows first patients, then functions' has been adopted. Designers, including architects are now focusing on integrating the needs of patients, hospital functions, and functionaries in hospital design (Singh & Biswas, 2018). There is also a growing body of rigorous studies to guide healthcare design regarding the improvement of patient outcomes. One of the aspects that should be focusing during the design processes is the improvement of non-clinical areas (Ulrich, Zimring, Zhu, Dubose, Seo, & Choi, 2008).

Main question of this study has been raised due to the rigorous research focusing on the relationship between the architectural quality of the hospital and patient outcomes. *What are the similarities and the*

differences of the use of non-clinical areas in hospitals in different contexts? The investigation of several hospitals in different contexts has been conducted to explore the limited and opportunities of the implementation of the patient focused design concept but only *focusing on 'non-clinical' areas*. Another thorough question that has been raised for this study is; *What can each hospital learn from each other and how can the knowledge of non-clinical hospital design, focusing on patient needs be exchanged between those hospitals?*

This study is an investigation of non-clinical areas in hospital case studies in multiple locations in Europe (Norway, Denmark, UK), Asia (Thailand, Singapore) and North-America (Canada). The purpose is to explore the similarities and differences in spatial arrangement and the use of them. Architectural quality, usability and cultural context are investigated regarding the design and use of the non-clinical areas. In this study it means any area in the hospital that which is not a clinical or medical ward. of the hospital because the areas are commonly used by patients and relatives. The aim is to examine whether a building assessment method could determine and explain the connection between people and the use of non-clinical areas in the different cultural contexts. How local culture influence the use, social interaction and the Usability and Architectural quality of the non-clinical areas of the hospital

2. Theoretical framework

Architectural design of hospitals can be supported by a comparison between different spatial design solutions and evaluation of best practice cases and simulations. Few evaluation methods are specifically designed for hospitals, but many include relevant techniques (Fronczek-Munter et al, 2017).

The theory consists of three main categories: healthcare building evaluation theories and methods, as Post Occupancy Evaluation; the Evidence Based Design (EBD) and finally the theoretical frameworks regarding the relationship between architectural quality and users, Usability and Pattern Language.

Evaluation methods for buildings

The most known evaluation methodology for buildings is *POE – Post Occupancy Evaluation*. According to the definition of Preiser et al. (Preiser et al, 1988; Preiser, 1989; Preiser, 1995), Post Occupancy Evaluation is "the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time". As building performance and usability assessments are

complex, they require multi-method strategies using a triangulation of methods and evaluations with multiple perspectives (Lindahl, Hansen, Alexander, 2012). Further research showed that hospital projects use various evaluation methods for different reasons (Fronczek-Munter, 2013, 2017). Newest research sees POE as “one of the suite of tools to measure building performance and should be used in conjunction with other methods to evaluate all aspects of a building, including the social, psychological and physical” (Deuble & de Dear, 2014). They suggest a combination of objective building performance data and subjective satisfaction ratings to achieve a valid and reliable evaluation of a building.

There are over 150 POE techniques available worldwide (Blakstad et al, 2008; Bordass, 2006; Bordass & Leaman, 2005; Leaman, Stevenson, & Bordass, 2010; McDougall et al, 2002; Stevenson & Leaman, 2010). The numerous existing methods often have one focus area that is evaluated more accurately than others. That fact is shown in *Evaluation focus flower model* (Fronczek-Munter, 2013), where many of the existing evaluation methods for buildings have been mapped according to their main focus. Figure 1 provides an overview of some of the evaluation methods, grouped and placed on the *Evaluation focus flower* (the USEtool, POE, narratives, Semantic evaluation). The methods chosen for this evaluation are described in methodology section.

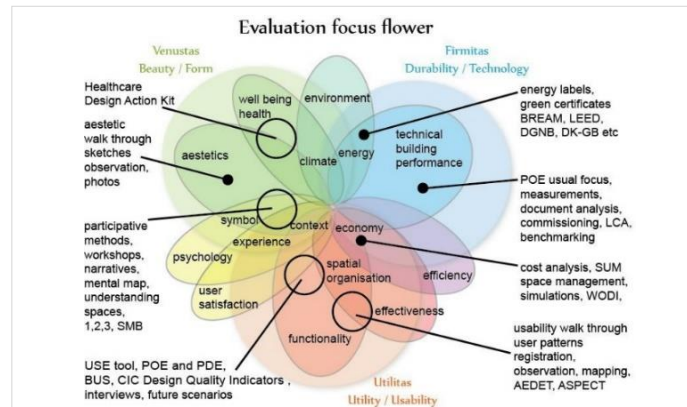


Figure 1 Evaluation focus flower model (Fronczek-Munter, 2013), with examples of evaluation methods and their main focus

Usability

Usability is a concept similar to functionality, but usability depends on: subjective view of users, context, culture, situation and experience (Fronczek-Munter, 2016, 2017). Most research on usability focuses on evaluating products or facilities with users, after they were developed or built. Usability evaluations of buildings are one of the ways to understand the connection between architectural solutions and the users needs, thus create better architectural design for supporting the users.

Pattern Language

The term 'Pattern Language' was introduced by an American architect, Christopher Alexander, where the theory is focusing on human-centred design in term of physical and social relationships. A Pattern Language is a method describing generic design practice that can be adapted in different contexts and culture. A Pattern Language (C. Alexander, S. Ishikawa, and M. Silverstein, 1977) expresses that every element of architectural function holds a general used called 'pattern' and every element can be connected from large to small scale (urban planning to ornament of room). As each society there is a particular pattern but these patterns overlap and share some similarities. The

languages we used in this investigation are (1) the degree of publicness (2) healthcenter (3) circulation realms (4) hierarchy of open space (5) common areas at the heart (6) sequence of sitting spaces (7) reception welcomes you (8) a place to wait (9) half private place (10) eating atmosphere (11) window overlooking life (12) structure follows social spaces (13) natural outdoor and window.

Evidence Based Design - healing architecture

The development of Evidence-Based Design (EBD) concept started with a publication by Roger Ulrich in Science (R. S Ulrich, 1984) with a self-explanatory title: "A view through a window may influence recovery from surgery". Ulrich provided the definition of EBD: "the design process, which is guided by an empirical understanding of the effects of health-care physical environments on safety, efficiency, and clinical outcomes" (R. Ulrich, 2006). Ulrich presents the strong scientific foundation with over 700 rigorous studies, which gives evidence that "good design of a hospital's physical environment promotes better clinical outcomes, increases safety, and reduces stress for both patients and staff" (R. Ulrich, 2006). He presented examples of a number of parameters from research, giving evidence that architecture affects health. Similarly, healthcare design is paying attention rigorously on the needs and well-being of patients (R. Ulrich, et al., 2008).

A few examples of the EBD parameters and typical remedies are summarised below:

1) Noise, stress – remedy: single-beds, sound absorbing ceilings, 2) Safety and reducing infections (airborne and contact) – remedy: single rooms, filtration, air changes, separation of patients, wash basins and gel dispensers close to staff work paths in visually prominent locations 3) Staff fatigue – remedy: floor layouts with decentralised nurse charting, observation stations and supplies dispersed close to patient rooms, viewing windows – visual access to patients 4) Depression and pain – remedy: higher daylight exposure in patients' rooms, via effects on serotonin, building orientation, view of nature and or people with positive facial expressions. Nevertheless, many of those elements are present in Scandinavian architectural long traditions of designing with access to daylight and views to nature.

Culture

Culture can play important role and influence the style of each individual architectural building (Rappaport, 2004). Culture, architecture, and design are three elements that architects, designers, and facilities managers should consider when working on an architectural complex project for example a hospital. The main purpose of design, in general, is to create environments that suit the users and is, therefore, user-oriented (Rappaport, 2004).

As this investigation is focusing on the observation of hospital non-clinical areas in several locations, we considered the cultural dimensions. One of the main cultural differences is the degree of *individualism* (M. Minkov, V. Blager, G. Hofstede, 2013; G. Hofstede, 2013). The fundamental issue addressed by the individualism dimension is the degree of interdependence a society maintains among its members. Northern European society is more toward the individualist while South-east Asian is more of a collectivist (G. Hofstede, et al, 1991; M. Minkov & G. Hofstede, 2012). In the individualist societies people's self-image is defined in terms of 'I' and they are supposed to look only after themselves and their direct family, whereas in collectivist societies people belong to 'we' or in groups that take care of them in exchange for loyalty (G. Hofstede, 2012; M. Minkov & G. Hofstede, 2012).

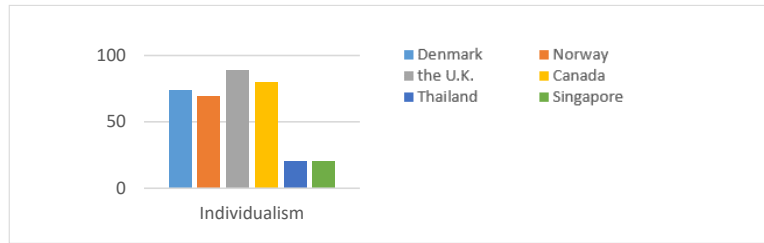


Figure 2 Cultural index scores of individualism dimension of Denmark, Norway, the U.K. Canada, Thailand and Singapore (G. Hofstede, 2013)

Another aspect that has influenced on the investigation is the healthcare system of each country. What is the first approach before patients reach the hospital and how patients access the hospital? There are vast differences in how healthcare system and medical insurance are organised. An example is Thailand, where there are no general practitioners (GP) therefore, everyone can directly access the hospitals while other countries GP is the gate keeper before patients reach the hospital. Other interesting aspect is the healthcare system whether the system is insurance based or fully subsidized by the government system. Denmark, Norway and Canada are fully or partially subsidized by the government, Thailand is a mixed system between government coverage scheme and insurance based system whereas Singapore and the U.K. is insurance based system.

3. Methodology

This research is conducted with qualitative research methods. The study is an empirical observation and investigation of the use of non-clinical areas of hospitals in different context. The approach of the study is inductive - particular examples are used to reach general conclusions. The case study methodology is chosen for the examination of details, for seeking answers to *how* and *why* questions and reaching conclusions from existing practices (Yin 2003). It allows testing ideas and theoretical concepts based on empirical data (Ragin and Becker 1992).

This research project began with literature review and development of the theoretical framework to review the collection of data and analysis of the study. After selecting the case studies, the investigation was conducted as a walk-through observation by one or both authors, to collect and document the first observation impression at 9 hospitals with multiple locations worldwide; (1) St Olavs Hospital Trondheim, Norway (2) Sudheds center, Copenhagen Denmark (3) Rigshospitalet, Copenhagen, Denmark (4) Maharaj Nakorn Chiang Mai hospital (5) Chulalongkorn Memorial hospital Bangkok (6) Khoo Teck Puat Hospital, Singapore (7) St Bartholomew's (Barts) Hospital, London, UK (8) New QEII Hospital, Welwyn Garden City, UK (9) Bridgepoint Hospital, Toronto, Canada. Data was collected and analysed using a combination of methods.

The similarities and differences of the architectural quality of non-clinical areas at the hospitals were compared and analysed. The study is aiming to explain the specific phenomenology regarding the use of non-clinical areas at each hospital and describe the current universal typologies that form high quality hospital architecture.

Combination of evaluation methods

We applied a combination of different evaluation methods: USEtool walk-through, Reflexive photography, Narratives, pictorial narrative mapping and Semantic differential scheme. This merge of methods appears to cover multiple topics and provide better explanations and understanding of architectural quality.

USEtool (Blakstad et al, 2009, 2010), is an evaluation method with five stages, including a systematic general usability mapping and a walkthrough with more in-depth qualitative studies of specific

usability topics. We use the walk- through stage with the usability focus, which gives valuable information in the usability theme and focus areas: functionality, spatial organisation, effectiveness, efficiency, user satisfaction. The result is a broad overview of the facility and the observations are well structured.

Reflexive photography is a generic method, seen both in research and practice, but also part of hospital evaluations by Maben, et al (2015), proposed for hospital staff. Reflexive photography is a type of photo-elicitation technique where research participants take photographs – formed the focus of ‘reflective’ discussion. The approach allows the participant to talk about the significance and meaning of photographs, which represent their perspective on the topic in question.

Reflexive photography can generate a visual record of the work environments and encourage research participants to critically analyse the ward layout, environment and facilities. It was used to prompt deeper consideration of positive and negative aspects of the spaces. The narratives were personal short explanatory written stories, combined with the photos.

Additionally, we added the third method- the semantic differential scheme, which can be used as generic, but here a specific example is used (Cold, 2013), with 8 parameters as: complexity, originality, pleasantness.

The results are capturing the immediate experience and evaluation of places, comparisons. Focus areas on *Evaluation focus flower model* are: beauty, aesthetics, symbol, psychology.

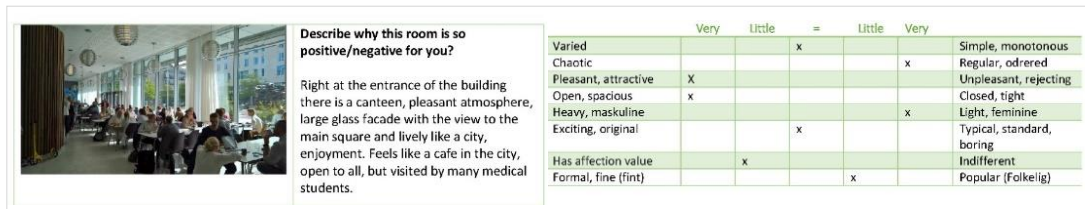


Figure 2 Example of evaluation at canteen, using three methods: Reflexive photography, narratives, semantic differential scheme

4. Description of hospital case studies

The case studies have been chosen from multiple locations in Europe (Norway, Denmark and UK), Asia (Thailand, Singapore) and North-America (Canada). The overview is presented in Table 1.

Hospital name, location	Overall view	Architectural layout	General information
St. Olavs Hospital, Trondheim, Norway			Function: Teaching hospital and regional hospital Client: St Olavs Size: 180,000 m2 Bed: 1,366
Sundheds center, Copenhagen, Denmark			Function: Health center Client: Size: 3,200 m2 Bed: no inpatient department

**Rigshospital,
Copenhagen,
Denmark**



Function: Teaching hospital and regional hospital

Client: Rigshospitalet

Size: 150,000 m²

Bed: 1,120

**Maharaj Nakorn
Chiang Mai,
Thailand**



Function: Teaching hospital

Client: Maharaj Nakorn Chiang Mai Hospital

Size: 108,500 m²

Bed: 2,000

**King Chulalong-
korn Memorial
hospital
Bangkok,
Thailand**



Function: Teaching hospital

Client: Choolalongkorn University and Thai Red Cross Society

Size: 220,000 m²

Bed: 1,433

**Khoo Teck- Puat
Hospital,
Singapore**



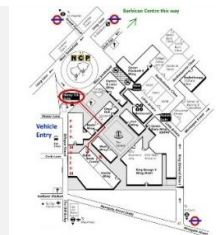
Function: Yishun district hospital

Client: Khoo Teck Puat hospital

Size: 110,000 m²

Bed: 550

**St
Bartholomew's
(Barts) Hospital,
London, UK**



Function: Teaching hospital, specialist cancer and cardiac centre

Client: Bart's Health NHS Trust

Size: 204,387 m²

Beds: 388

Dates: 1123 - 2014

**New QEII
Hospital,
Welwyn Garden
City, UK**



Function: NHS local hospital: primary, acute and social care

Client: NHS

Size: 8500 m²

Beds: only outpatient

**Bridge-point
Wells Hospital,
Toronto, Canada**



Function: Specialist hospital

Client:

Size: 63,170 m²

Beds: 480

5. Development of Typology, Evaluations of types of rooms

The study included observations and evaluation of many types of hospital spaces. Their comparisons helped us develop the Architectural typology of waiting areas, where examples are presented together with our evaluation and suggestions for high quality architecture, based on scientific literature and our observation. The typology is structured in seven following groups:

1. the large waiting area
 - 1a) large waiting area without zoning similar to airport waiting area
 - 1b) large waiting providing zones,
2. the long corridor waiting room with chairs along
3. the small area aside corridor
4. the waiting space next to window
5. the outdoor waiting, relaxing
6. the food place and canteen
7. the unplanned waiting space

Architectural typology of waiting areas

1a). the large waiting area like airport

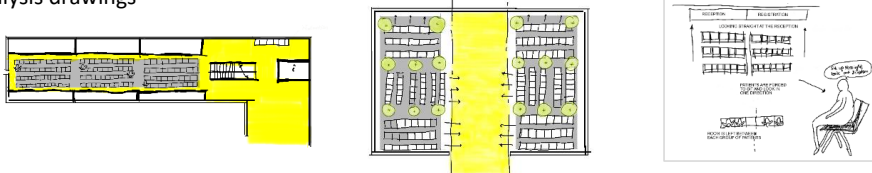


Maharaj Nakorn Chiang Mai Hospital

Rigshospital

St Bartholomew's hospital

Analysis drawings



Maharaj Chiang Mai - the large waiting area serves the registration, cashier and pharmacy in the same waiting areas. The feeling is airport-like, crowded, stressful. The materials are plain, no activity or zones provided.

Maharaj Chiang Mai ward waiting area – There is a nice overview over the registration desk, light and good standard materials, but it feels crowded and there are no zones, just chairs along the walls, no daylight or view, too many posters and signs, resulting in clutter.

Rigshospital - Waiting areas for blood sampling registration. It is not a very large area but it looks like a waiting area in the airport with chair placed in rolls. Patients are waiting for the registration and have their blood taken. This also includes all the patients in the 'inpatient' department.

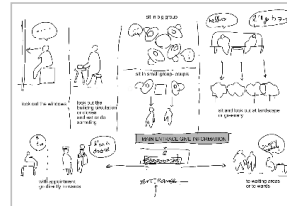
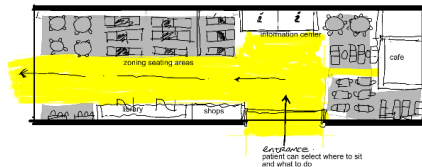
Bartholomew's Hospital, London - Large waiting areas in the covered atrium - Daylight from glazed roof, large airport-like feeling, large scale, seating facing many directions and provided small tables, trees, colours and high quality materials, interesting architectural design to observe

1b). the large waiting area providing zones,

Rigshospital

Bridgepoint Wells hospital

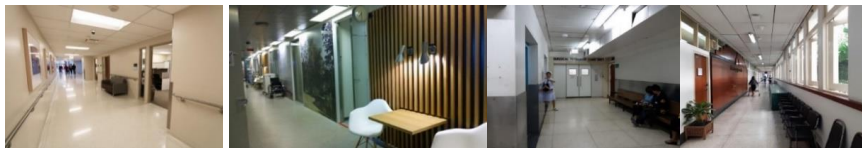
St Olavs hospital

Analysis drawings

Rigshospital, Copenhagen - Waiting area in the hospital's main entrance hall – There are large windows with view to main entrance and city, seating is divided into zones, small scale seating facing many directions, small tables, relaxing atmosphere

Bridgepoint Wells, Toronto - Entrance with information/registration desk and waiting area with comfortable sofa seating at the side, along corridor, with large window and park view, partially enclosed, taken to side of the corridor with semi-private feeling. Feels both open and private.

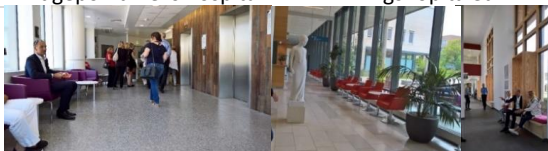
Bridgepoint Well hospital - Entry ambulatory- natural circulation overview, register, relax at comfortable sofa/bench, with large windows and view over the registration desk, open, organised
St Olavs - Ward bevegelsessenter waiting area - Good overview over the registration desk, spacious, light and large glazed view to garden, seating zones, sculptures, plants, pleasant relaxing atmosphere, open, feels like art museum

2). corridor waiting room with chairs along

Bridgepoint wells hospital

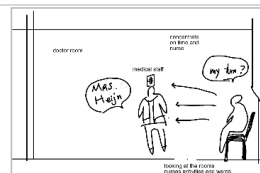
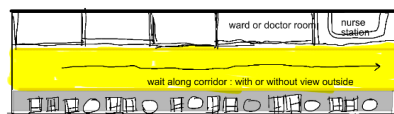
Rigshospitalet

Maharaj Narkorn Chiang Mai hospital

St Bartholomew's hospital
CityK

St Olavs hospital

New QEII Hospital, Welwyn Garden

Analysis drawings

Bridgepoint Wells hospital - long corridor with small seating space - Functional, light colours, feels spacious but a bit sterile and exposed

Rigshospital Copenhagen, Small table with two chairs - Small open corridor area made comfortable, relaxing and cosy by light, wooden materials and designer lamps and chairs, feels less stressful and more like home or hotel, feels a bit dark, no views to outside

Maharaj Nakorn Chiang Mai Hospital, Waiting along the wall next to elevator in front of Surgical intensive care unit -

Easy to find, right out of elevator, feels very exposed – everybody walks here and looks, no daylight, plain colours and materials, no activity just waiting

Maharaj Nakorn Chiang Mai Hospital, Long corridor waiting at directors floor – Log row of windows providing daylight, view of garden, space, relaxing

St Bartholomew's Hospital, London, Waiting along the wall next to elevator and windows - Easy to find, right out of elevator, exposed, but walls turned aside and small tables provided, daylight, strong colours and different materials, busy but pleasant

St Olavs, long corridor waiting – seating aside the open corridor, with daylight, sculptures, plants, view to garden, natural, light materials, open, calming atmosphere

New QEII Hospital, Welwyn Garden City, UK, - long corridor waiting, large windows providing daylight and view of garden, space for seating open to corridor, but hidden in a zone along a wooden frame, feeling private and undisturbed

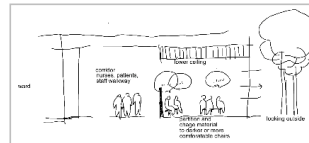
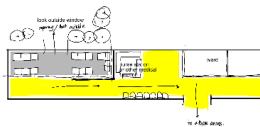
3). small area aside corridor



St Olavs hospital

Rigshospital

Analysis drawings



St Olavs Hospital, aside corridor waiting- seating aside the open corridor hidden in a “cave” with lower ceiling, but provided daylight and view of garden, space, zone for kids, comfortable chairs looking at corridor or garden

Rigshospital, aside corridor -seating taken a bit aside and hidden away from the corridor, comfortable armchairs and tables, zones, colours, no daylight, feels comfortable, but dark

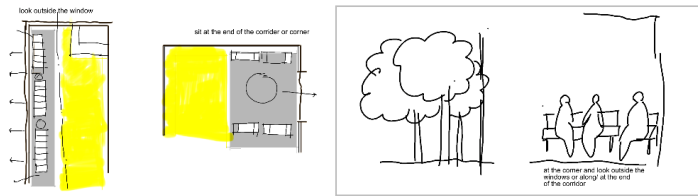
4). the Space Next to window used for waiting



St Olavs hospital

Maharaj Nakorn Chiang Mai hospital

Analysis drawings



St Olavs hospital- the area is used for both entry, registration, canteen and waiting, with many zones and differentiated seating materials and colours, art pieces on the walls and free-standing sculptures, large windows with view and daylight, light natural materials, seating by the window popular

Maharaj Nakorn Chiang Mai Hospital – large corridor space with a window, popular seating on a bench next to window, overview of space, view out, daylight

5). the outdoor garden relaxing



Khoo Teck Puat Hospital

St Bartholomew's hospital

St Olavs hospital

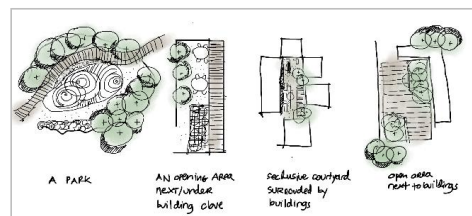


St Olavs hospital

Bridgepoint wells hospital

Sundheds center

Analysis drawing



Khoo Teck Puat hospital - Entrance and central square with garden. Feels relaxing, very green, surrounded by plants, birds, butterflies, water, feels like in botanical garden, lowering stress, calm, beautiful

St Bartholomew's Hospital - square with large fountain, trees and seating, historical site, belonging, open and inviting

St. Olavs hospital - central square between medical centers, providing seating areas, trees, sculptures, different zones for seating, feeling busy - as part of the city, busses, cars, and people passing by

St Olavs hospital -garden outside – large garden, feeling in nature and relaxing, calming atmosphere, used by patients, relatives, staff and open to public, feeling of neighbourhood and public area

Bridgepoint Wells Hospital, Toronto -terrace garden - View over city and nature, relaxing, large, open

Sundheds center, Copenhagen - Stunning architectural quality: beauty and functionality, small intimate places to sit and rest, talk with someone, look at trees and plants, interesting and surprising shapes, small scale, high quality

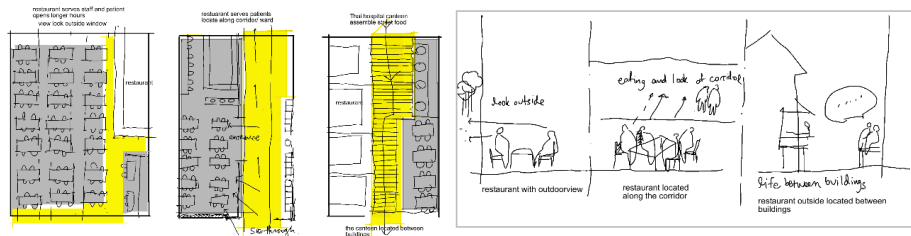
6). the food place and canteen



St Olavs hospital

Chulalongkorn Hospital

Analysis drawings



St. Olavs Hospital, Kunnskabssenter, canteen - Open, light, large full-height windows with views to outside street, open to all, both visitors and medical staff, easy accessible, located at the ground floor

St Olavs , ward canteen at Mother and Child center, busy but cosy atmosphere, light and with large windows, different chairs, materials and colours, healthy food, natural materials, plants
Chulalongkorn Memorial hospital, patient and staff canteen – busy, with large windows with views, large variety of healthy food, simple plastic seating, plants

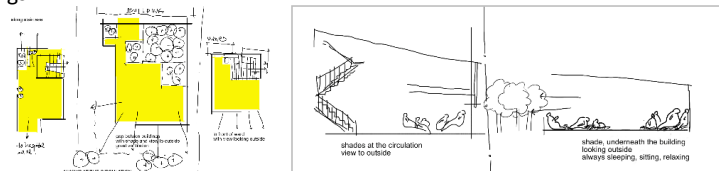
Chulalongkorn Memorial hospital, restaurants between buildings. The concept of these small food vender imitated from Thailand street food concept, using spaces between buildings previously used by homeless, small, narrow and busy, but cosy spaces, covered by transparent roofs, providing healthy food, easily accessible to everyone

7). the unplanned and informal waiting area



Maharaj Nakorn Chiang Mai hospital

Analysis drawings



Maharaj Nakorn Chiang Mai hospital- Waiting at the staircase - it is colder (positive in Thailand), light, view, wind breeze, privacy. It is not allowed to stay here because of fire safety, solution could be to plan for waiting areas with those qualities and find them in other places
Waiting in the entrance area under a high building – areas used for waiting and eating by large groups of family members of patients

3. Discussion

The presented Architectural typology of waiting areas at hospitals gives an overview of current state of spaces and evaluation of their architectural quality, based on data collected from the multiple hospital case studies and analysis based on scientific methods.

It is easy to spot differences between the hospitals on different continents, with different sizes and cultures. The main cultural difference we observed are different healthcare organisations, the family structure and collective culture, resulting in for example the large waiting rooms, feeling like airport. But more striking is the similarity of both the typical hospital spaces of high architectural quality and usability, and the challenges, as prioritizing efforts and ensuring evacuation routes, user-friendly signs, space shortages, beds and equipment stored all possible places.

The observation of case study hospitals resulted in developing of the Architectural typology of waiting areas, with the seven common types of spaces, with examples as: large waiting area like airport, the long corridor waiting room with chairs along, the outdoor waiting etc.

We found many of the spaces evaluated as pleasant, beautiful or relaxing and of high quality had a few common features, many known from Evidence Based Design, as: large windows providing daylight and view to green areas with trees, interesting seating spaces next to windows, often organized in zones, providing flexibility and choices of specific place to wait.

We found examples of successful waiting areas even along the corridor, specially if there could be organized some shelter from the traffic, in form or spatial recession, turned walls, armchair seating or locating of the seats in groups rather than along the walls.

In some of the cases we found the unplanned waiting spaces, where the location and qualities of space, as shelter from sun, view to park; were inviting the hospital visitors, specially large groups of family members, to rest and wait there, even when there was no official seating provided. The needs of the relatives have so far not been met with any particular attention, even though the nurses tell that relatives and social support are important for the patient's wellbeing and recovering process. This discussion is also known at European and American hospitals, where changes in the patient groups are changing the demand for the secondary areas. The study also investigated how culture is an influential factor on the experienced quality of a space design.

The combination of evaluation methods, as USEtool walk-through, Reflexive photography, Narratives, pictorial narrative mapping and Semantic differential scheme, helped in comparing and structuring the results from the observations at the hospitals and in comparing and describing the architectural quality of the specific spaces.

4. Conclusions

This evaluation of hospital non-clinical areas in multiple cultural contexts gives fundamental understanding of the influence of culture and well-being of patients to the design of hospitals and perceived quality and usability of architecture. Even though the hospitals are located on different continents, they share similarities as the specific types of use in the non-clinical spaces. The

significant similarity in the use of those non-clinical spaces correlate with the usability concept where users and their satisfaction are the most important aspects of design and architecture quality of hospital buildings. The results from the multiple case studies form the discussions to what are the current universal typologies that form high quality hospital architecture.

5. Acknowledgement

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8. Photographs sources

All photographs are taken by: AFM – Aneta Fronczek-Munter, or SP- Supuck Prugsiganont

Except following, at Table 1:

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Appendix 3

Paper 3

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

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Abstract

Objective – This paper investigates the perspective of nurses toward the concept of user-focused design approach implemented in hospital waiting areas. The study is based on perspective of nurses from an 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, interviews 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

Nurses 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 period at the hospital are perceived as long, uneventful, and stressful [1][2]. Therefore, many hospitals intend to improve the quality of physical setting of non-clinical areas, as this can improve patient and family experiences 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 support the implementation of patient-focused approach in the design of hospitals [4]. Planning and design of healthcare facilities have been shifting 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 can be key evidence in creating healthcare environments that can improve the clinical outcomes. There is also an increase in the involvement of clinical nurses during hospital design processes [9]. Clinical nurse 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 is at the moment 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 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 investigation of perspective of nurses, who had been involved in the design process were investigated towards 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 a 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 development of user interfaces for computer software, but it has later also be used for instance 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-user' [12]. Therefore, patients' need is one of the important aspects during hospital design processes as 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, 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, and exclude participatory design methods [20]. Personas can engage teams in things about users during the design process, making efficient design decisions without inappropriate generalization, and communicating about users to various stakeholders [21][22][23][24][25]. Personas use 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 process a concrete methodology is employed, for example data collection to develop the main users of particular design

project has to be organized: user profiles and scenarios should be developed 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 dimension renderings, fishbone charts, mock-ups)
- Discourses (for example, questioning situations, typical action situations)
- Processing (for example, prototyping, visiting other departments)

Four characteristic 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. The evaluation are mentioned below under data analysis. The data from 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 includes, 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 - Interview 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 brief evaluation of waiting areas in the ultrasound ward and the meetings between nurses, the researcher, and the hospital architect. The analysis of 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 from 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.

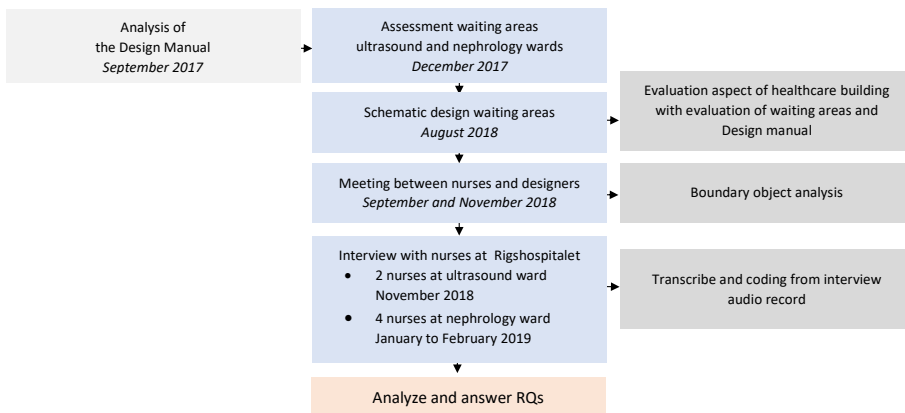


Figure 1: Methodology applied in this study

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 Stærmosø 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, the project is an on-going process which began in 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 patient profile, list of furniture, and layout of the waiting area.
- Clear guideline for meeting between different stakeholders: meeting 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.

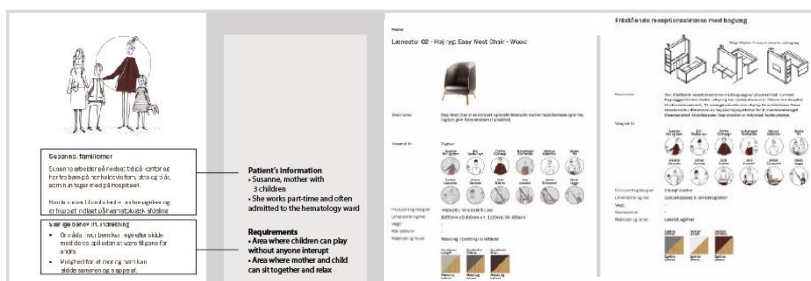






Figure 2: Example of a patient profile, furniture catalogue, and layout of the waiting room from the Design Manual

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 head nurses of the clinic. The nurses looked through the manual and contacted the hospital architect regarding three requirements includes, number of seat 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 	
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 	
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 	
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 what 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 were 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 seat, 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 overweight pregnant lady with handles

Increase patient privacy through the design of seat and partition:

- Replace gurneys with reclining chairs, replace curtain with partition, and add more seat for family members
- Specific couches where individual or couple 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 who works closely with patients know the exact number of patients, who would

[illegible]

The original waiting area provides 51 seats (figure 6 on the left) including two benches and three gurneys. After the design intervention architect provides three zones with variety of seats including couches and armchairs (figure 7 on the right). Small seats were replaced with couches for patients with long-waiting-time in the first zone. The second zone, armchairs and couches are provided for pregnant ladies and their company. Round table was installed in the middle of the waiting area with room for patient in wheelchair. The third zone, two inclining chairs which, can be adjusted as normal seats are provided together with adjustable couches, small seats are installed for patient's family and friends. 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.

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.

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

These findings indicate that nurses understand the concept of 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 user-focused design approach and know that 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 patient
- Architectural quality
- Hygiene
- Privacy

These findings resemble the concept of user-focused design of waiting areas. The nurses indicated that they pay attention to patient 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 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 **were 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 develop 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 presents results of an investigation of clinical nurse involvement in design briefing by 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 the 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 illustrate 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 design of the waiting area as they can look through the manual and select furniture that align with patient profiles. Nevertheless, the manual should be updated regularly and be tested in the different clinics throughout the hospital.

8. References

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Appendix 4

Paper 4

OPTIMIZING PATIENTS' JOURNEY AND WAITING EXPERIENCES IN PUBLIC HOSPITALS: A QUALITATIVE STUDY COMPARING THAILAND AND DENMARK

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Abstract

Comparison of hospital patients' care journeys and experiences from an international perspective is highly understudied. In a partnership between a Thai and a Danish universities this study was completed to reach the following aims: (1) To compare Thai and Danish patients' care journey and waiting experience when receiving care in a public hospital and (2) explain from patients' perspective opportunities to optimize their journeys, and elaborate on the social and cultural and contextual elements of their needs. Semi-structured interviews were conducted with 21 patients to investigate the patients' care journeys to determine what factors could improve their journey including waiting experiences. Qualitative content analysis and thematic analysis were conducted. According to the study results, the structure and organization of the healthcare system and the hospital management system are the factors that have the most significant impacts on patients' care journey including their waiting experiences. The physical requirements and design of hospital waiting areas are supporting factors that improve patient waiting experiences and well-being. The cultural context and the social structure should also be considered in hospital development and design processes in the future.

Keywords: Public hospitals, Waiting areas, Patient experience, Patient journey, Waiting experience, Thailand, Denmark

Introduction

Most medical processes in hospitals, including acute and emergency cases, involve waiting. It happens throughout healthcare activities — from identification and diagnosis of a healthcare problem through treatment until anticipation of the disease outcome (Fogarty and Cronin 2008; Jiang et al. 2017). Patients can experience stress while waiting (Pati and Nanda 2011), and the provision of opportunities for patients to relax and rest in calm environments is a minimal requirement for their health and well-being (Larsson, Bergman, and Fridlund 2010).

The rise of the evidence-based design approach has spurred a paradigm shift in the understanding of the hospital physical environment, viewing patients as end users and their needs as one of the most important aspects (Andrade et al. 2017). Ulrich (1991) and Ulrich et al. (2004) explained that to promote well-being, the design of the physical environment should support patient care by providing a sense of control, access to social support, and exposure to positive distractions. Recent research has mostly focused on patient experiences of bedrooms and medical wards. Only a few studies have paid attention to patients' care journey and their waiting experiences, even though waiting areas play a crucial role in patient experiences during hospital visits (Anåker et al. 2019).

Patient journeys and clinical pathways may have different meanings across stakeholders. Simonse, Albayrak, and Starre (2019) described a patient journey as a comprehensible representation of a health service and its procedures, including relationships and feeling from a patient perspective. The different actors that the patient meets during his/her journey are part of the patient journey and their interaction is described in the service touchpoints. In this study, a patient journey refers to the process of a patient entering, experiencing, and exiting healthcare facilities and keeping patients at the center of the study (Richardson, Casey, and Hilder 2007). To date, patient journey concept has been adopted by a number of healthcare organizations however, there is still lack of in-depth understanding of patient journeys and their experiences at healthcare service touchpoints especially waiting areas.

Maister (2005) and Norman (2009) stated that waiting can be frustrating and time consuming. Hospital waiting can be filled with anxiety as patients and families wait in limbo, often in dull, dreary surroundings that cause anxiety, and they completely lack information, stimulating many levels of negative emotions (Norman, 2009). Seven criteria from the psychology of waiting lines theory were used in this analysis of patient waiting experiences: (1) occupied time feels shorter than unoccupied time; (2) people want to get started; (3) anxiety makes waits seem longer; (4) uncertain waits are longer than known, finite waits; (5) unfair waits are longer than equitable waits; (6) the more valuable the service is, the longer the customer will wait; and (7) solo waits feel longer than group waits (Jones & Peppiatt, 1996; Maister, 2005).

Froneczek-Munter and Prugsiganont (2018) categorized public hospital waiting areas and rooms into seven typologies: (1a) large waiting areas without zones; (1b) large waiting areas with distinct zones; (2) waiting areas with chairs along a corridor; (3) small waiting areas alongside a corridor; (4) waiting areas next to windows; (5) garden and outdoor waiting areas; (6) dining and canteen waiting areas; and (7) unplanned and informal waiting areas. These seven types of waiting areas appear in public hospitals on three continents, Europe, Asia, and America. However, there is still a lack of investigation on what factors can improve patient waiting experiences and how they do so.

Thailand and Denmark have different cultures and values and seem to have few similarities in their environmental contexts and social structures. Schein (2004) defined culture as a group's shared values that become visible in action and the social structure. Culture and social structures consist of visible and invisible elements (Baek, Kim, and Harimoto 2019; Selfridge and Sokilik, 1975). The elements comprising culture are complex and often compared to an iceberg whose main part is

hidden underneath the surface (Baek et al., 2019; Selfridge and Sokilik, 1975). Hofstede et al. (2010) defined six dimensions of culture: (1) power distance; (2) individualism; (3) uncertainty avoidance; (4) masculinity; (5) long-term orientation; and (6) indulgence. These six dimensions were used to analyze interviews with patients on the impacts of culture on their waiting experiences.

It is important to provide insights that can optimize their experiences and inform the future development of the hospital design process. This study was aimed at (1) comparing Thai and Danish patients' care journey and waiting experience when receiving care in public hospital and (2) explain from patients' perspective opportunities to optimize their journeys, and elaborate on the social and cultural elements of their needs. The main research questions framing this investigation were: What aspects emerge from investigating patient experiences and journeys, and how can these aspects influence patient waiting experiences? What information can be obtained from studying patient care journeys and waiting experiences, and how can that information influence the design of waiting areas?

Method

The study was based on interviews with patients in two public hospitals; Maharaj Chiang Mai Hospital, Thailand and Rigshospitalet, Denmark. The interviews were conducted in the waiting areas of the ultrasound, nephrology, kidney treatment, and oncology wards and any place the patients preferred (e.g., the hospital café). The first author obtained ethical approval and contacted the head nurses of several clinics with chronic patients at the two hospitals. Only the aforementioned wards accepted the request and gave permission for the interviews.

Recruitment was limited to individuals who had been patients in the Thai or the Danish hospital in the past year (2018–2019). The participants comprised 21 patients, including 12 from Thai hospital, nine from Danish hospital, and one who attended both the Thai and the Danish hospital. The participants' age varied from 25 to 70 years old. The participants included seven men and 14 women, and their duration of treatment ranged from 0.5 to 35 years.

The study used semi-structured qualitative interviews. Such interviews can help researchers obtain a deeper understanding of human experiences (Braun and Clarke 2014), in this case, waiting experiences. The interviews took place between September 2018 and June 2019. The first author obtained ethical approval and contacted the head nurses of each ward. Next, the first author met face to face with the patients and sought their consent to participate. The participants' confidentiality was guaranteed, and they were informed that they could withdraw from the study at any time without giving any explanation or experiencing any consequences in their future treatment.

The interviews were audio-recorded, an interview guide with open-ended questions was employed. The researcher used the same interview guidelines for all 21 participants. The interview questions were divided into three sections: first, brief personal information (i.e., age, sex, and time of treatment); second, patient perspectives and experiences of the healthcare system and their medical care journeys; and third, patient perspectives on waiting area experience. The interviews lasted 30–55 minutes each.

Verbatim transcriptions were made of the audio recording. Thematic analysis was employed for data analysis (Anåker et al. 2019; Braun and Clark 2014; Erlingsson and Brysiewicz 2017; Wraption et al. 2017) and data management and coding were aided by the use of ATLAS.ti. Units of meaning and later preliminary codes were developed by detailed attention to the transcripts and grouped into categories with related content. Both authors discussed the expressions of underlying meaning in the overall analysis to determine the emerging themes and validate that those themes answered the research questions.

Results

The results are divided into two sections addressing the themes that emerged from the analysis of the interviews with the patients at the Thai public hospital and the Danish hospital. The overall themes were similar, but some specific aspects were different.

Themes from Thailand

Theme 1: Structure and Organization of the Healthcare System

The structure and organisation of the Thai healthcare system significantly impacted a number of the patients, and most of the participants reported that the Thai public hospital was overcrowded with high patient numbers on a daily basis. The following comments reflect this situation.

“Everyone comes to this hospital. I mean everyone because it is the best hospital in Chiang Mai, but they don’t have a good waiting area atmosphere here. It is really depressing. On Monday and Wednesday, you don’t even have space to stand.”

Most participants stated that there was also high demand for medical treatment but a lack of resources, including insufficient healthcare distribution in rural areas. The participants commented that there were not enough community hospitals or healthcare staff, leading to high patient numbers and overflowing at the large public hospital. Some patients mentioned the lack of gatekeepers or general practitioners (GP) was also a reason for the high patient numbers in the public hospital. Most participants believed that the high demand for medical treatment and the lack of medical resources were the main reasons for the high number of patients in the Thai public hospital, which affected the hospital services and physical environment.

Theme 2: Hospital Management System

Some participants commented that the expansion and development of the hospital lacked long-term planning for the architecture, master planning, future expansions, and direction of future treatment and technologies. The lack of long-term planning could lead to confusing hospital navigation and wayfinding. Some participants mentioned a lack of expertise and knowledge in hospital planning, hospital facilities management, and hospital design, including frequent failures to involve different stakeholders in each stage of the design process. Some patients stressed the lack of a patient-focused approach in hospital services and design.

“This hospital or any public hospital still lacks a medical planner or someone who has knowledge about medical planning or someone who knows about the size of equipment, storage, hospital flow, medical process, number of patient, standards, etc.”

Theme 3: Physical Requirements for Hospital Waiting Areas

Four different but intertwined requirements to improve the public hospital waiting areas emerged from the analysis of the patient interviews.

- **Control**

The participants expected to have more of a sense of control, including empowerment, during their medical journeys. Most patients mentioned that they had to be picked up and dropped off by their families due to the long walking distance from the parking building to the clinic. The patients added that it would be easier if the hospital provided drop-off and pick-up services for vulnerable groups of patients.

“It’s impossible to come to the hospital by yourself or alone if you are vulnerable, old, or sick because the parking building is really far away, and navigation is horrible. I wish the hospital would provide an affordable pick-up and drop-off service because I hate to bother my daughter about my hospital trips.”

The patients also suggested that they expected to have control over the waiting times and how long they waited. Members of the Thai public are used to long waiting times, but if they were informed about the waiting times, they had the freedom to go to the toilet and get some food and drink.

- *Comfort*

Many participants expected to have some comfort while they were waiting, especially for long waits. More than half of the patients suggested access to greenery or plants for a relaxing atmosphere.

"I've been an oncology patient here for a year now ...So I would want a garden and some seats in the garden close to the clinic with easy access."

Others suggested comfortable chairs suited for the profiles of the patients, many of whom were elderly or vulnerable or used wheelchairs. Due to long waiting times, most of the participants stated that they would like to have support facilities such as nearby toilets, restaurants, cafés, beverages, and hand sanitizer.

- *Hospital Standards*

Since the 1990s, Thai hospitals have adopted hospital accreditation standards for quality of care, safety, and hygiene, among others (Smits, Supachutikul, and Mate 2014). Although public hospitals have sought hospital accreditation, the participants still mentioned a lack of basic standards of care in waiting areas, particularly seven aspects: cleanliness, hygiene, privacy, safety, noise level, and access to daylight and outside views. Many patients emphasized the cleanliness and hygiene in the waiting rooms and areas. However, privacy and safety were also important aspects prioritized by most patients. Long-term patients with chronic diseases preferred low noise levels and access to daylight and windows with outside views. Some patients also mentioned good air ventilation because they did not want to get sicker while waiting to see the doctor.

"Privacy is also very important in the hospital. I don't find it here [Maharaj Hospital]"

"Safety is also important; the floor is very slippery when it's wet"

- *Hospital Space Management*

The participants reported that layout and organization of the hospital clinical and non-clinical areas could affect their waiting experiences and journeys and be time consuming. Two participants mentioned that elevator queues were extremely long due to the location of the outpatient clinics on the higher floors. One patient wondered why all the administrative offices were on the lower floors, while the outpatient clinics were on the higher floors. The participants suggested that not only the horizontal but also the vertical organization of clinics had important impacts on patient waiting experiences and journeys. Some patients added that the hospital should establish clear zoning between clinics' waiting areas.

"Some of the administrative office should be upstairs, but they are all located on the first or second floor. All the outpatient clinics are upstairs, so the queue at the elevator is really long, especially in the morning. You need to pick up a queue card at the elevator just to get on one."

Theme 4: Social Structure and Culture

Healthcare staff's mentality had significant impacts on patient waiting experiences, and most participants mentioned that they had received good service and care from medical staff. However, hospital services were slow and unorganised, resulting in a poor physical environment.

I like this place [the dialysis clinic] as they [the nurses and doctors] take care of me as part of their family, but the service is so slow, and the area is small with way too many people."

The social hierarchy affected patient behaviour and attitudes toward medical staff. Half of the participants accepted the current conditions of the hospital services and physical environment. Patients added the reason they accept the hospitals current services and physical condition is

because they prefer to have smooth interaction. Therefore, complaining about the hospital services and physical environment might raise conflict between patients and healthcare staff and lead to even slower services.

3.2 Themes from Denmark

Theme 1: Structure and Organization of the Healthcare System

Three different aspects of the Danish healthcare system were identified in the analysis of the interview transcripts.

- *Distribution of Danish Healthcare Facilities*

Denmark established a clear classification of hospital and healthcare services in which general practitioners (GPs) act as hospital gatekeepers. GPs give primary treatments and healthcare services, reducing the number of hospital patients. All the participants stated that only in emergency cases were patients allowed to go directly to hospitals. Otherwise, those who were ill were obliged to contact their GP.

Each public hospital provided different types of specific treatments and specializations, creating an equal distribution of patient numbers across the public hospitals. The participants also said that because each Danish public hospital provided specific treatments, patients within the region had to travel from one hospital to another for different treatments. Most participants expressed positive views that the Danish healthcare system prioritised treatment of highly fatal and severe diseases, including organ failure, oncology, and cancer. One patient who had been in both Thai and Danish hospitals said he had received treatment much more quickly in Denmark than Thailand.

"When the GP referred me to the hospital, it was much faster than in Thailand because in Thailand, you have to wait for months for the first PET scan and biopsy. But here in Denmark, they treat cancer patients as their first priority, while Thailand doesn't do that."

Most patients said that they were satisfied with the Danish healthcare system due to universal health coverage, which contributed to positive patient journeys and waiting experiences.

- *Implementation of an Online Medical Service Platform*

Denmark has used the online healthcare platform Sundhed.dk since 2003 (Danish eHealth portal 2020). The e-portal centralised patient medical information and gave patients and staff access to Danish healthcare services. Patients could access their medical records and other healthcare services, such as online scheduling with specialised medical consultants and receiving notes from doctors. Most patients noted that the online portal allowed data transparency because they could access their medical records and see their laboratory and pathology results and doctors' comments. One patient who had been to both Thai and Danish hospitals compared the two countries' healthcare systems and emphasized the data transparency of the Danish online medical record.

"If I compare the Danish and Thai healthcare system, Denmark has a better system because the information is centralised. Everything is online, including my medical journey, history, doctors' comments, and results from pathology, etc. No matter which hospital I go to, the doctors can just go back to my previous medical records because everything is uploaded in the system, and it is very transparent."

Theme 2: Hospital Management System

Since 2010, the Danish government has launched a campaign to increase the number of hospitals, building 16 hospitals to support rising number of future patient (Fronczek-Munter 2013). Some participants mentioned that medical clinics had been rearranged and relocated to prepare for hospital development and expansion. A couple of patients said that existing buildings had been improved amid preparations for the new buildings.

Most participants at the Danish hospital stressed the organization of hospital services, including the queueing system and information. The patients received appointment details (date, time, clinic location, telephone number, and map) via telephone texts and e-mail. The patients could easily come directly to a clinic, give their healthcare card to a nurse, and then wait for the doctor.

The patient-centred approach was also employed in hospital services because patient needs and opinions were considered when modifying the hospital system and services. A participant described the concept of the patient-centred approach.

“A positive thing about the Danish healthcare services is that they try to be as informative as possible. It means that they try to think from patient’s perspectives as much as possible. If you look at dialysis in Denmark in general, medical staff always ask, ‘What can we do for this person to live a normal life as much as possible?’”

Furthermore, most participants stated that the hospital provided useful navigation information because there was always a map attached to the e-mail for the first appointment. Half of the patients said that an information centre and signage were at important spots. The information centre was easily accessible at the entrance, and signage was in the main intersection in the hospital.

Theme 3: Physical Requirements for Hospital Waiting Areas

Four interconnected requirements emerged from the analysis of the interviews with the Danish patients. These requirements were overall similar but some specific aspects were different from those of the Thai patients.

- *Control*

The participants stated that they had control over their care journeys because the hospital provided uncomplicated navigation and facilities for vulnerable patients. The patients also told that the hospital provided useful information about the queueing system, and nurses kept them informed if their appointments were delayed due to emergency situations. Two patients added that the signage made navigation simple and easy. Most patients expressed they had control over time and navigation.

“Navigation at Rigshospitalet is really logical, and if you have been there once, it’s really easy. If you don’t know the way to the clinic, you just go to the information centre, and then you usually know where to go.”

- *Comfort*

For long waits, the participants requested access to and views of greenery and plants, along with comfortable furniture, because these aspects create a relaxed, home-like atmosphere. The patients described that being in the hospital could be stressful, so outside views and a relaxed atmosphere could act as distractions from their illnesses.

“I think the feeling that you get, when you go to the hospital, is always stressful and sad if your health is going downhill. But it can still be a nice experience if the physical environment — looking outside a window a bit on a sunny day — can provide you with a little, relaxed, homey feeling.”

- *Hospital Standards*

The participants mentioned seven hospital standards; hygiene, privacy, organization of furniture, positive distractions, food and beverages, windows and outside views, and useful information. Although these standards were implemented in most waiting areas in the hospital, the patients added that these standards should be implemented equally throughout the waiting areas. The three aspects most frequently mentioned were hygiene, privacy, and organization of furniture. Half of the

patients wanted to have privacy in which they could discuss private matters with their families or could be left alone when they received bad news. One patient said that she did not want a luxury waiting room but preferred a standard hygienic, organised room with comfortable seats.

“When you are really ill, you like to cut the world out. You don’t want to talk to anyone. ... I’m doing okay, but please privacy. It might be a problem because sometimes when you got a bad news, you can’t really cry because everybody can see you crying — falling apart. You might want to get comforted and just want to cry.”

- **Hospital Space Management**

The participants suggested new ideas for waiting area typologies. For example, outpatient clinic waiting areas should provide zones for short and long waits to allow for privacy, whereas inpatient clinics should provide two separate zones for socializing and privacy. One participant who was a regular patient requested work stations for long waits. The patients expressed that hospital should avoid having corridor waiting areas for long waits as the area cause stress due to a lack of privacy. Half of the participants described that the hospital waiting areas often lack a personal atmosphere. Most participants mentioned patient and staff involvement as the key to providing waiting areas that met patient needs and requirements. One patient who had been to both the Thai and the Danish public hospitals stressed two important points. First, the physical environment of the Thai hospital was similar to the Danish hospital, but the Danish hospital had a much better organised system. Second, the participant stated that queueing information was important to positive care journey and waiting experiences. Information about queueing give the patients freedom and control over their life.

“I think what makes high-quality waiting areas — I wouldn’t say it’s 100% the physical environment. I would say that it’s the hospital management system. In Thailand, appointments are not appointments, so I don’t know what to expect in terms of time, so you cannot plan your life, and you waste your whole day in the hospital with a crappy and stressful environment. That is the main reason why going to the hospital creates a lot of frustration and stress. Here, in Denmark, appointments are appointments. You know what’s going to happen and what to expect, so you can plan your life in advance.”

Theme 4: Social Structure and Culture

Two different aspects of the social structure and culture had impacts on patient waiting experience. Danish culture play an important role in the mentality of healthcare staff and patients. As Danish value power of sharing, trust, and participation (Douglas and Douglas 1989; Grenness 2003; Heller and Wilpert 1981; Hofstede, Hofstede, and Minkov 2010). Most patients mentioned that they had good relationships with trusted medical staff who understood their life situations. Patients also added that Danish culture prioritised value of sharing and trust.

“They see you as a patient, and they also see you as a person, that you have a job and life. In Denmark, you can say to the nurse or doctors, ‘Really, but it is not good for my work, so how can we arrange the treatment plan to suit my work and my life schedule?’”

Furthermore, the participants added that Denmark has a flat hierarchy, which influence the patient waiting experiences. Patient mentioned low social status difference between medical staff and patients due to flat hierarchy. Therefore, they felt comfortable discussing their life situations with medical staff while waiting. Another factor in Danish culture is that the patients tended to keep up their normal lives and routines, even though they were severely ill. Three patients with chronic diseases expressed that maintaining their careers was important to them because work and normal life were distractions from their illnesses. Most of the participants accepted unexpected long waiting times for emergency cases because the Danes were relaxed as well as very structured people.

4. Comparison and Discussion

Structure and Organization of the Healthcare System

The study shows that the structure and organization of the Thai and Danish healthcare systems and hospital management systems have significant impacts on patient care journeys and waiting experiences. In 2002, Thailand adopted universal health coverage, and the scheme has tremendously improved access to medical treatment and services among low-income, marginalised, elderly, and vulnerable groups of people (Limwattananon et al. 2012; Paek, Meemon, and Wan 2016). This situation has led to high demand for medical treatments, but healthcare resources remain low, especially in rural areas (Limwattananon et al. 2012). The incongruence between the availability of medical resources and the demand for medical treatments is a fundamental reason for the high patient numbers in large public hospitals. Furthermore, the Thai healthcare system does not provide GPs in local healthcare services who could act as medical gatekeepers and screen unnecessary cases from specialised and large hospitals (Prugsiganont and Jensen 2019). The poor primary care services and the lack of local GPs force patients in rural areas to travel to large public hospitals.

Denmark has decentralised its healthcare system and has clearly defined hospital and healthcare services (Danish Ministry of Health 2017; Olejaz et al. 2012;). Responsibility for primary and secondary healthcare lies with regions and municipalities (Olejaz et al. 2012). GPs function as gatekeepers to the Danish healthcare system (Strandberg-Larsen et al. 2010), and each public hospital provides different types of specialised treatments. Moreover, implementation of the eHealth portal allows patients to access waiting list information, email and schedule appointments with their primary care doctors, review laboratory test results, view medication lists and profiles, and renew prescriptions (Danish eHealth portal 2020). However, the primary and secondary healthcare services belong to regional authorities, so patients are restricted to the primary and secondary healthcare services of their home region, which can limit healthcare choices. Every patient is assigned a specific local GP who has sole responsibility for the patients assigned to the practice (Strandberg-Larsen et al. 2010).

Hospital Management System

The Thai patients frequently mentioned the unorganised hospital system, particularly four factors: first, a lack of long-term hospital planning; second, a lack of expertise and knowledge of hospital planning/designing and a tremendous lack of user involvement in the planning process; third, a lack of useful information about the queueing system, navigation, and hospital services; and fourth, slow services due to high patient numbers. Most participants expressed negative feelings about coming to hospitals due to slow, time-consuming services and a lack of information about the queueing system. Jones and Peppiatt (1996), Maister (2005), and Norman (2009) explained that waiting experiences in hospitals are often stressful due to the uncertainty of patient health situations and the lack of information. Uncertain waits in stressful environments can stimulate negative emotions. According to the results, it is clear that the Thai public hospital has failed to provide useful queueing information.

In 2007, Denmark launched a major healthcare reform, including a guarantee to reduce waiting time to schedule appointments at the hospital from two months to one month. This reform led to an increase in hospitals and hospital buildings (Olejaz et al. 2012; Vrangbaek 2015). Currently, more than 28 hospital projects, including 16 new hospitals, are underway to more quickly provide medical treatment (Fronczek-Munter 2013). This development aligns with the findings obtained from the participants at the Danish hospital, who mentioned that some medical clinics have been rearranged and relocated to prepare for hospital development and expansion. This indicates that Denmark has prepared for long-term expansion to support increasing patient numbers and treatment and technology development. Many participants said that the Danish hospital arranges organised

hospital services, and they receive appointment details via text and government e-mails. The hospital also provides other useful information, for example through an information centre and signage. Denmark has included patient involvement in national-level quality assurance programs accrediting hospitals based on a set of common standards (Vrangbaek 2015). The patient involvement aim at meeting patient needs, which affects hospital accreditation standards because assessments usually include national patient experience surveys (Vrangbaek 2015). The interview data confirm earlier research indicating that a patient-centred approach is employed in hospital services as patient needs and opinions are considered in the development of Danish hospitals.

Physical Requirements for Hospital Waiting Areas

Physical requirements for hospital waiting areas was considered second priority to patient experiences and journeys compared to the structure of the healthcare system and hospital management system. The physical environment can optimize patients care journey and waiting experience, but healthcare system and hospital management system have stronger impact. However, four different factors were mentioned: control, comfort, hospital standards, and hospital space management. The four factors may have influence on the design of waiting areas and can contribute to the improvement of patient waiting experience. The factors mentioned by the participants align with the theory of supportive design (Connellan et al. 2013; Ulrich et al. 2004; Ulrich et al. 2008).

- ***Control***

The Thai patients expressed a desire to become more independent and empowered. The participants requested shorter distances between parking and hospital buildings. In contrast, the Danish patients said that they have control over navigation and their medical journeys over time. The Danish participants mentioned that the hospital provides uncomplicated navigation and facilities for vulnerable group of patients. However, some participants added that colour codes could be useful to improve navigation.

- ***Comfort***

The participants in the Thai and Danish hospitals both requested access to greenery and a relaxed atmosphere providing positive distractions. Many studies have indicated that greenery has positive impacts on patient well-being and relief stress (Ulrich et al. 2006). Due to long waiting times, the Thai and Danish patients suggested that the hospitals should provide comfortable chairs appropriate for patient profiles along with supportive facilities such as cafés, restaurants, and nearby toilet.

- ***Hospital standards***

Both the Thai and Danish patients mentioned seven hospital standards (cleanliness, hygiene, privacy, safety, noises, and access of daylight and outside views), which accord with studies on improving patient well-being (Douglas and Douglas 2004; Ulrich et al. 2004). The Thai patients valued hygiene, and half of the Thai participants identified a lack of hygiene and privacy due to the high patient numbers. Although Thailand has adopted accreditation standards, but maintaining them remains difficult due to the limited resources and the high demand for healthcare treatment (Pongpirul et al. 2006). Similar to the Thai participants, the Danish hospital patients prioritized hygiene and privacy as the most important hospital standards.

Hospital space management

Unorganized location of clinics can lead to confused navigation and be time consuming. This issue is related to the hospital management's lack of expertise and knowledge of hospital planning/designing in Thailand. The Thai patients reported that it is necessary to create clear zoning between each clinic's waiting areas. Danish participants suggested a typology of waiting areas for outpatient and inpatient clinics; areas that provides patients choices of seats and privacy. Danish

patients also stressed that the hospital should avoid having corridor waiting area for long waits. This information aligned with studies of patient social rooms (Anåker et al. 2019; Douglas and Douglas 2004) which suggests that hospitals should provide several small areas with groups of furniture where patients can sit and have some privacy and temporarily withdraw. Findings also indicate that information about patient profiles can help hospital planner develop waiting area that meet specific needs of patient in each clinic. Patient profiles have been introduced in the design process of Danish public hospitals. Rigshospitalet implemented a design manual in the renovation of hospital waiting areas in 2017 (Prugsiganont, Jensen, and Poulsen 2019).

Social Structure and Culture

Thai society values smooth interactions and conflict avoidance (Deveney 2005). It is important that Thais remain passively unemotional and disengage to avoid giving offence to others (Deveney 2005; Mulder 2000). Thais also hold in high regard interpersonal moral values, particularly being grateful, caring, forgiving, obedient, and mutually dependent. Furthermore, similar to other countries in Southeast Asia, Thailand is considered to have a high power distance, so inequality in society is accepted (Hofstede, Hofstede, and Minkov 2010). Most Thai patients reported that they receive good services from medical staff, and they accept the current conditions of hospital service even when the services are slow, and the physical conditions are poor. These findings indicate that Thai patients do not complain about slow services and poor physical conditions to avoid conflicts or giving offence to the staff who, in turn, understand patients' situations and try to ease their frustration by giving good services. In contrast, the Danish value power sharing, trust, and participation (Douglas and Douglas 1989; Grenness 2003; Heller and Wilpert 1981; Hofstede, Hofstede, and Minkov 2010). Equality among Danish people is important, and the power distance is low, indicating a rather flat hierarchy (Grenness, 2003; Hofstede et al. 2010). Danes value being unprejudiced, which means that all people should be able to say their opinions and allow others to share theirs as well (Berg, 1986; Grenness, 2003). The participants at the Danish hospital stated that they have good relationships with trusted medical staff who understand their life situations. The hospital provides flexible treatment plans that suit patients' life situations, and patients are often encouraged to maintain their career and normal routine.

Conclusion

The study findings identified four important themes. The structure and organization of the healthcare system and the hospital management system and services have significant impacts on patient waiting experiences. Useful information regarding the queueing system, estimated waiting times, and navigation are the most important factors that positively influence patient journeys and waiting experiences. Hospital standards and space management facilitate and support patient experiences and well-being.

Although the themes are similar, the Thai and Danish patients expressed different opinions and perceptions. The Thai participants requested a more organised and faster hospital system, services, and a minimum requirement physical environment (nearby toilet, enough seating, etc.). The Danish participants shared that their journeys are uncomplicated and organised, and they are satisfied with their waiting experiences. However, they value hygiene, privacy, standard waiting areas, and a therapeutic atmosphere with greenery, plants, and outside views. Culture affects the mentality of patients and staff. Thais are more likely to deal with the current conditions of the hospital, whereas patient needs are considered in the Danish hospital design and healthcare system. Nevertheless, both countries share a similar mentality among medical staff, who are understanding and provide good services to patients.

The Thai healthcare system needs to be reformed to be able to tackle the high patient numbers, and the hospital management system should be able to provide useful information. In Denmark, the

healthcare and hospital management systems are relatively organised because the country has a decentralised healthcare system and centralised patient medical information. However, Denmark is preparing for increased patient numbers in the future by expanding healthcare facilities.

Disclosure statements

No potential conflicts of interest were reported by the authors.

Notes on contributors

Supuck Prugsiganont is PhD student at DTU Management, Technical University of Denmark with a background as architect from Thailand and with special interest in the design of hospital non-clinical areas including waiting areas.

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Appendix 5

Paper 5

THAILAND VS DENMARK: IMPROVING PATIENT JOURNEY AND WAITING AREA FACILITIES THROUGH PATIENT AND STAFF OPINIONS

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Abstract

Purpose: This study aims to compare and identify patient and staff experience and opinions that can be utilised to inform hospital planners, including hospital facilities managers, to optimise patient journey and wait experience in public hospitals.

Methods: A two-step method was employed. The first step involved a walk-through observation to assess the physical environment of non-clinical areas in a Thai and a Danish hospital. The second step consisted of interviews with 38 participants, including patients and staff from the two hospitals. Content and thematic analysis were used to analyse the interview transcripts.

Results: Findings from the walk-through observation showed that the two hospitals had different architectural qualities. The Thai hospital failed to meet hospital accreditation standards, whereas the Danish hospital focused on patient needs. Four waiting area types were found in both hospitals, and one specific waiting area type was only found in the Thai hospital. Five different themes emerged from the interview analysis. Both groups of participants stated that structure and organisation of healthcare system and hospital management system and service have the most significant impact on patient care journey and waiting experiences, whereas they felt that hospital space management and planning and physical environment in waiting areas have less of an impact on patient journey and waiting experiences. Moreover, the participants stated that patients' needs, a patient-focused approach, and social structure should be considered during the hospital planning and design processes.

Originality: This is the first comparative study of patient and medical staff opinions and experiences that focuses on patient care journey and waiting experiences at Thai and Danish public hospitals.

Keywords: Thailand, Denmark, Public hospital, Waiting area, Patient and staff, Opinions, Experiences

1. Introduction

Hospitals' non-clinical areas, which include public spaces, waiting areas, and supporting facilities, play an important role in patient health and well-being (Jiang et al., 2017; Pati and Nanda, 2011). Most medical processes involve 'waiting' from the moment that a patient begins their care journey, from the diagnosis of a health problem until a health outcome is achieved (Fogarty and Cronin, 2008). Although patient care journey and waiting experience may have an influence on a patient's clinical outcome (Center of Health Design, 2015), little attention has been paid to the design of non-clinical areas, including waiting facilities.

Jiang et al. (2017) described that waiting areas are a commonplace encounter among people seeking healthcare treatments and that they have become a topical issue in the research and design of healthcare environments. Hospital waiting experiences can be filled with anxiety and stress due to patients' health conditions and a lack of useful information available (Fogarty and Cronin, 2008; Norman, 2009; Pati and Nanda, 2011). Depressing surroundings in waiting areas can also prevent patients experiencing a relaxed and calm atmosphere (Jiang et al., 2017). In addition to the knowledge that physical environment affects patients' stress levels, when given the opportunity, healthcare professionals such as doctors and nurses can have a significant influence on the patient care journey, especially the waiting experience, as they can identify situations that affect patient healthcare choices (Harris and Richman, 2002; Fogarty and Cronin, 2008). Moreover, healthcare staff can provide information that might have been overlooked by healthcare planners and facilities managers.

Thailand is a developing country with a predominately low- to mid-income population. Denmark, on the other hand, is considered one of Europe's most affluent countries, and it has a highly efficient healthcare system. Denmark is preparing for an increase in need for medical treatment, as 6.4 bn euro have been invested in 16 new hospital projects (Danish Ministry of Health, 2017). As Thailand and Denmark are both facing ageing in their societies and are preparing for the resulting high demands of medical treatment, it may be useful to compare and identify patient and staff experience and opinions that can be utilised to inform hospital planners and facilities managers to improve the patient care journey and waiting experience. Three research questions were framed for this study: First, what are the characteristics and physical conditions of non-clinical areas in Thai and Danish public hospitals? Second, what are the differences and similarities between the experiences and opinions of patients and staff in relation to hospital waiting areas? Third, how can the information about patients' and staff's opinions and experiences optimise patient care journeys and the design of waiting areas? This paper provides an original, comparative study of the two countries, which has never been done before.

2. Background and theoretical basis

2.1 *Healthcare environment and patient stress*

The concept of evidence-based design (EBD) is based on the knowledge that the physical environment can contribute to health and well-being (Becker and Parsons, 2007; McCollough, 2009). Recently, many healthcare facilities, including hospitals, have begun implementing a patient-centred approach, where patients' needs, perceptions, and satisfaction are being used as important inputs for the hospital design process (Patterson et al., 2017; Locatelli et al., 2015; Stichler, 2012). Andrade et al. (2017) described that healthcare environments have a direct link to both objective and subjective indicators of patient stress levels. They emphasise the enhancement of the environment in waiting areas, which can improve mood, alter physiological state (Leather et al., 2003), or even lower reported anxiety of patients before and after consultant with a doctor (Rice et al. 2008). Arneili and Devlin (2002), Becker and Douglass (2008), and Thompson et al. (1996) also added that the physical environment of waiting areas can have an impact on patient anxiety, stress, perception of quality of care, and perception of waiting time.

2.2 Patient-focused approach integrated in hospital service and patient journey

Service blueprinting is an analytic method from the field of service design that aims to optimise service processes (Shostack, 1982). Coenen et al. (2011) applied this method to facilities management (FM) in the healthcare sector, where an FM service blueprint represents medical and non-medical processes in healthcare facilities (intake, waiting to see the doctor, receiving treatments, hospitalised, and discharged). In order to deliver and validate the effectiveness and efficiency of healthcare services, customers known as 'patients' can take part in giving feedback to improve services. Therefore, patients' behaviour, perceptions, and experiences should be considered and integrated in services design to enable the effectiveness of primary activities (Coenen et al., 2011; Von Felten et al., 2012). User-centred service design is an approach that can identify problems for improving pathway design and new services delivery (Simonse et al., 2019). Therefore, the best way to obtain insights through patient perspective and experiences is through customer journey (Nenonen et al., 2008; Simonse et al., 2019). A customer journey represents the practicality of an FM service blueprint, representing each stage a customer goes through while experiencing the use of product or services (Nenonen et al., 2008; Stickdorn and Schneider, 2012; Van Boeijen et al., 2014; Kimbell, 2014). In healthcare service, the customer journey can be described as a 'patient care journey'. Simonse et al. (2019) described a patient journey as a comprehensive representation of a healthcare service and its procedures, including relationships and feelings from a patient perspective. One of the advantages of investigating patient journey is that it allows for examination of patients' entire experience, rather than setting it out in a piecemeal fashion; it also emphasises that patients must remain at the centre of any analysis (Richardson et al., 2007). In this study, patient journey refers to the process of a patient entering, experiencing, and exiting healthcare facilities, with a special focus on their experience of the non-clinical facilities and waiting areas.

2.3 Psychology of waiting and typology of waiting area

Maister (1985) and Norman (2009) noted that waiting can be frustrating and time-consuming. Seven criteria from the psychology of waiting in line theory (Norman, 2009) are used for the analysis of the opinions and experiences of patients and medical staff. The seven criteria are: (1) occupied time feels shorter than unoccupied time; (2) people want to get started; (3) anxiety makes waiting time seem longer; (4) uncertain waiting times are longer than known, finite waiting times (5) unfair waiting times are longer than equitable waiting times; (6) the more valuable the service is, the longer the customer will wait; (7) solo waiting feels longer than group waiting (Jones and Peppiatt, 1996; Maister, 1985). As a means to understand hospital waiting areas, one study (Author, 2018) categorised public hospital waiting areas and rooms into seven typologies: (1a) large waiting areas without zones; (1b) large waiting areas with distinct zones (2) waiting areas with chairs along a corridor (3) small waiting areas alongside a corridor; (4) waiting areas next to windows; (5) garden and outdoor waiting areas; (6) dining and canteen waiting areas; (7) unplanned and informal waiting areas.

3. Method

The study was carried out over a three-year period and consisted of two main parts. Findings from the first part led to the design of second part; the first part involved walk-through observations, imitating outpatient journeys in both hospitals (Maharaj Hospital in Chang Mai, Thailand and Rigshospitalet in Copenhagen, Denmark) in order to assess the physical conditions of non-clinical areas in both hospitals (Haron and Hamid, 2011; Fronczek-Munter, 2016). In the second part, semi-structured interviews were conducted to obtain better insights into patient and staff perceptions and their experiences in hospital non-clinical areas; in this case, waiting areas were the specific focus of the study. As this study employed a combination of qualitative methods, Figure 1 illustrates the steps of the methodology.

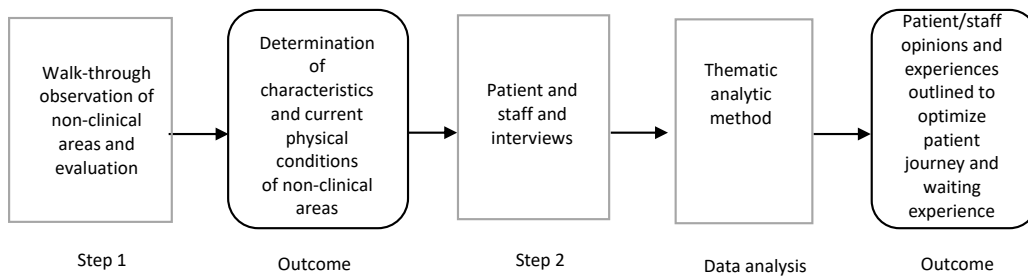


Figure 1: Methodological steps employed in this study

3.1 Walk-through observations

Walk-through observations were conducted following the usability method of assessment based on three evaluation guidelines. These were Clinic Design POE (The Center for Health Design, 2015), evaluation guidelines of healthcare facilities (Van der Voordt and Van Wegen, 2005), and Rigshospitalet's waiting areas assessment guidelines. These three guidelines were used to set up clear evaluation guidelines to evaluate the waiting areas of Maharaj Hospital and Rigshospitalet. Some of these findings were published in two earlier publications (Authors, 2019a; Authors, 2019b). The findings from the building assessment alone were not enough to provide insights regarding patients' waiting experience, their personal opinions, or the patient journey during their hospital visit. Therefore, the second step of data collection—patient and staff interviews—was later conducted.

3.2 Patient and staff interviews

Interviews were conducted using a qualitative design with an inductive and thematic analytic approach (Strass and Corbin, 1998; Creswell and Poth, 2012; Patterson et al., 2017; Anåker et al., 2019). The interviews were intended to obtain and compare insights of patients and staff needs and opinions concerning the patient care journey and hospital waiting areas.

Participants in this study were recruited from the patients and staff at the two hospitals. The study involved 38 participants, including interviews with 21 patients and 17 medical staff. Interviewed patients were limited to people who were older than 18 and who had been a patient in the Thai or Danish hospital in the past year (2018 to 2019).

Medical staff were limited to doctors and nurses who had worked in the hospital for at least one year. Their ages varied from 30 to 65. Both patients and staff were specifically from nephrology wards, kidney treatment wards, oncology wards, and ultrasound wards, as those are the wards that have full permission for both patients and medical staff to be interviewed. Table 1 illustrates the number of participants, including patients and staff.

Table 1: Demographic of patients and staff interviewed

Participants		Thailand (n=)	Denmark (n=)	Gender
Patients		12	9	F n=14 M n=7
Staff	Doctor	4	2	F n=1 M n=5
	Nurse	5	6	F n=10 M n=1
Total		21	17	

3.3 Data collection

The study used semi-structured qualitative interviews (Creswell and Poth, 2012) which can help researchers obtain a deeper understanding of human experiences (Strass and Corbin, 1998). In this case, the human experience involved people's opinions, needs, and experiences of waiting areas. The interviews took place between December 2018 and August 2019 in waiting areas of the ultrasound, nephrology, kidney treatment, and oncology wards. The first author obtained ethical permission and contacted the head nurse of each ward. The information and aim of the research, including the interview questions, were sent to the head nurses prior to the interviews. The first author met face-to-face with participants and asked them for permission to participate. Both patients and medical staff were guaranteed confidentiality. They were informed that they could withdraw at any time without giving explanation and without any consequences.

Interviews were audio recorded and transcribed *verbatim* by the first author and two research assistants. An interview guide that contained opened-ended questions was used to ensure that similar data were collected. Interview questions were divided into three sections: (1) personal information (age, gender, time of treatment/experience as medical staff), (2) patient perspectives of the healthcare system and medical journey, with an emphasis on a user-focused approach, and (3) patient and staff perspectives toward waiting areas. For staff, an additional question asking '*what can be done to improve the communication between designers and staff to provide better input for the design process*' was added to the interview guide.

3.4 Data analysis

Data were analysed by the first and second authors, where a thematic content analytic method was used (An ker et al., 2019; Patterson et al., 2017). Data were transcribed *verbatim*, and the first author defined the unit of meaning from the transcript documents that related to the research questions. Later, the first author coded units of meaning by searching important key phrases using the Atlas.ti program. The first and second authors discussed the important key phrases that indicate patient/staff expectations and opinions; these include (1) hospital services, (2) hospital waiting areas, (3) hospital space management problems, and (4) other related key points. The first author grouped related content codes to create categories, and finally, the first and second authors discussed the expression of underlying meaning from the codes and categories to determine emerging themes and validate whether the themes answered the research questions.

3.5 Ethical permissions

Ethical permission was varied due to the different rules and regulations of Thailand and Denmark. For Thailand, ethical permission was obtained through the board of committee of Maharaj Chiang Mai Hospital. For Denmark, the first author contacted head nurses directly for permission (National

Committee on Health Research Ethics), as additional permission is only necessary for research projects that involve clinical trials.

4. Results

4.1 Results from walk-through observations of non-clinical areas

A combination of healthcare facilities evaluation guidelines was used to evaluate the non-clinical areas of Maharaj Hospital and Rigshospitalet. According to the evaluation data, Maharaj Hospital failed to reach healthcare facilities evaluation standards or the requirements for waiting areas provided by Rigshospitalet. By contrast, Rigshospitalet focused more on patients' expectations, needs, and comfort, as the hospital provides better quality of non-clinical areas. Figure 2 illustrates the current conditions of the non-clinical areas Maharaj Hospital and Rigshospitalet and presents the characteristics of the two hospitals' waiting areas.

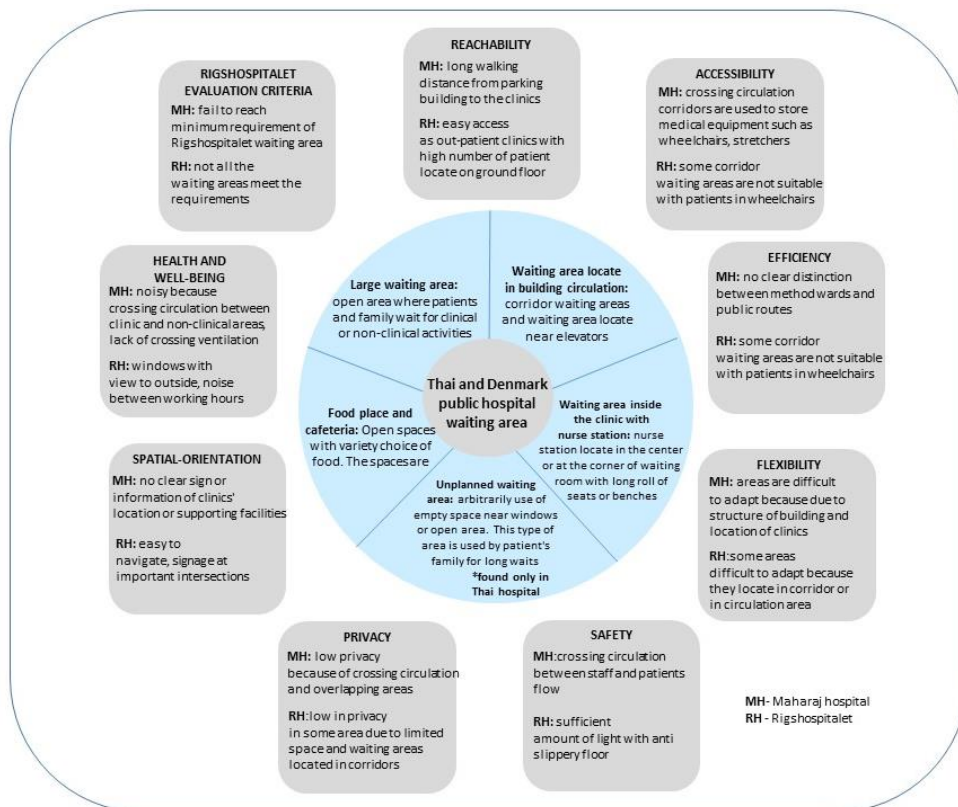


Figure 2: current conditions of Maharaj hospital and Rigshospitalet and characteristics of their waiting area

4.2 Results from interviews with Thai patients and staff

4.2.1 Thai patients and staff: Five themes emerged from the analysis of the interviews of patients and staff. Four of these themes were addressed by both groups of participants (structure and organisation of the Thai healthcare system, disorganised hospital management system, hospital space management and planning process, and social structure) and one particular theme (patients' needs and patient-focused approach) was only mentioned by staff.

Thailand Theme 1: Structure and organisation of healthcare system

Category 1.1: Incongruence between healthcare resources and medical treatment

Patients mentioned that the high number of patients led to long waiting time, whereas medical staff mentioned that high numbers of patients and limited healthcare resources led to a lack of space in hospital. Moreover, the hospital is taking more patients than its capacity, which leads to a high workload for medical staff.

Category 1.2: Centralised healthcare service

Patients expressed that there is a lack of healthcare services, including insufficient healthcare distribution in rural areas. A shortage of community hospitals and a lack of general practitioners (GPs) also lead to a high number of patients overflowing the large public hospitals. Medical staff noted that de-centralising of the healthcare system or re-organisation of hospital according to the disease types would help reduce the number of patients.

Thailand Theme 2: Hospital management system

Category 2.1: Lack of long-term management and planning

Patients and medical staff noted a lack of long-term management and planning, including architectural planning, master planning, and direction of future treatments and technologies.

Category 2.2: Lack of screening process and organised queueing management system

Patients expressed that a lack of proper and unorganised screening processes led to a high number of patients and extremely slow service. Patients added that everyone can 'walk-in' for medical treatment. Moreover, the hospital does not prioritise the urgency of disease. Medical staff mentioned that technology, including online registering and screening processes, could help reduce the high number of patients and unnecessary cases. Both groups of participants mentioned that patients are likely to experience long wait times in the clinic waiting areas due to a lack of queueing information.

Thailand Theme 3: Hospital space management and planning process

Category 3.1: Overall physical environment

Sub-category 3.1.1: Current condition of hospital physical environment

Patients mentioned a lack of space management and organising location of clinics, which leads to poor navigation and time-consuming waits. Staff added that there are cross-circulation flows between services and patients, which can be unhygienic. Both patients and staff expressed that the hospital buildings are outdated, as they have been in use since the 1970s. All five of the hospital's buildings have been through several expansions and renovations; many clinical and non-clinical areas were ad-hoc empty spaces. Therefore, the design of the areas does not match the original purpose.

Sub-category 3.1.2: Problem regarding hospital design process

Medical staff mentioned a lack of involvement in the design process and a lack of records of patient data. They added that patient records are important for hospital development, as patient data give insights and can be used for the design of the entire hospital.

Patients and staff added that there is a lack of three main aspects, which lead to the failure of hospital space management (1) lack of user involvement and patient-focused approach in the design process (2) lack of expertise and knowledge in hospital planning and FM, including failures to involve different stakeholders in each stage of the design process (3) lack of knowledge, leading to unorganised clinics, confusing hospital navigation, failure to meet hospital accreditation standards, and incompetent hospital functions.

Sub-category 3.1.3: Suggestion for improvement

Medical staff mentioned four main suggestions for improvement of hospitals: (1) hospital functions and its accreditation standard are the most important aspects for space management. Hospital space management and planning should be based on service and patient flows as the main aspects of hospital function. (2) Implementation of user involvement during the planning process, as insights can be provided by users. (3) Space management and organisation of related clinics and non-clinical areas should be located near each other. (4) The hospital should provide clear guidelines for the building's life-cycle, which includes planning for renovation and expansion. Hospital areas should be flexible to allow for future expansion. Both patients and staff added that a patient-focused concept should be employed during the design process, especially in relation to patients' privacy and comfort.

Category 3.2: Hospital waiting areas

Sub-category 3.2.1: Current condition and characteristics of waiting areas

Patients expressed that corridor waiting areas should be avoided for long waits due to a lack of clear zoning between public and private zones and the resulting low privacy. Medical staff added that non-clinical areas were not integrated into the hospital design process; hospital planners, designers, and facilities managers focus more on clinical areas. Many waiting areas do not meet hospital standards and are not suitable for patient profiles, as the areas were not originally part of the design process. Both groups of participants added that the hospital's waiting areas' lack of established clear zoning between clinics led to a lack of privacy and comfort.

Sub-category 3.2.2: Suggestions for improvement

Patients and medical staff mentioned four core components **(1) Control**, as patients would like to be able to control their medical journey and wait time. Patients requested pick-up and drop-off services and clear information about waiting times **(2) Comfort**, as this aspect should be integrated in waiting areas design, where hospitals focus more on patients' privacy. Moreover, waiting areas should provide a welcoming atmosphere by offering positive distraction, beverages, and comfortable seats. **(3) Hospital standards**, as four aspects, including cleanliness, hygiene, safety, and level of noise, were the main concern for waiting area design. Staff mentioned that the hospital should be aware of cleanliness, hygiene, and patient safety. **(4) Access**, as the location of the nurses' station in the waiting area should be easy to access, providing an overview of the whole area. Medical staff mentioned **waiting area typology and supporting facilities (5)**, and two types of waiting areas were suggested. First, in areas where patients wait for/during medical processes, information should be provided about waiting time and comfort. Second, in areas where patients wait after a medical process, positive distraction and comfort should be provided.

Thailand Theme 4: Patients' needs and patient-focused approach

This theme was only mentioned by medical staff, who described different meanings for the concepts of *patients' needs* and *patient-focused approach*. Staff added that patient needs are the core component of hospital services, as patients want to be treated and they expect fast service. On the other hand, staff expressed that a patient-focused approach involves understanding a patient's circumstances and their life situation. Hospitals need to position themselves as a service business that balances meeting patients' needs with a patient-focused approach.

Thailand Theme 5: Social structure

Patients mentioned that they received good services and care from medical staff and that this good care from staff compensated for slow hospital services, unorganised systems, and the poor physical environment. Patients added that they accepted the poor condition of the hospital because complaining does not lead to solutions or faster services. Medical staff described that each patient is always accompanied by three to four family members for social support. Despite the poor physical conditions and slow services, staff are willing to provide the best care they can to patients.

4.2.2 Danish patients and staff: The analysis of interview transcripts led to the emergence of five themes. Similar to the Thai participants, four themes were mentioned by both patients and staff, and only medical staff mentioned the theme of patient needs and patient-focused approach.

Denmark Theme 1: Structure and organisation of healthcare system***Category 1.1: General problem of healthcare system***

Patients and medical staff mentioned that patients from other regions are transferred to the hospital for complicated diseases, leading to a high number of patients and the need for more space.

Category 1.2: Distribution of Danish healthcare facilities

Patients mentioned that Danish government established a clear classification of healthcare services, where GPs acted as hospital gatekeepers. Moreover, each hospital provides a different type of special treatment and highly fatal and severe diseases are prioritised for healthcare treatments.

Category 1.3: Implementation of an online medical service platform

Patients described that an online platform was introduced and has been used since 2003 (Danish eHealth portal, 2020). This platform allows for data transparency and centralises patients' medical information. Patients can access their medical records, read their health journal, and schedule appointments with medical consultants.

Denmark Theme 2: Hospital management system***Category 2.1: Organise hospital service providing useful information***

Patients mentioned that hospital provides them useful information, where appointment details, including a map, are sent via mobile phone texts and e-mails. The information centre is easy to access, and signage is always located in the main hospital intersection.

Category 2.2: Implementation of a user-focused approach and change in hospital service

Patients expressed that their needs and opinions were heard and integrated into treatment plans that fit each patient's schedule and circumstances. Medical staff added that the term patient-centred approach was used in the hospital, citing the example of the statement 'the doctor will see you now' having changed to 'the doctor will come and get you now', which gives more of a sense of equality to patients.

Denmark Theme 3: Hospital space management and planning process***Category 3.1: Overall physical environment***

Patients and medical staff mentioned that waiting areas are not the first priority of hospital planning. A lack of space leads to moving waiting areas to treatment or storage rooms.

Sub-category 3.1.1: Suggestion for hospital design process

Medical staff provided two major suggestions. First, user involvement leads to the efficiency of areas that are suited to patient and staff needs, patient profile, and hospital function. Second, that hospital function and standard are the most important aspects of the design process, rather than aesthetics. Both groups of participants noted that user involvement is the key to successful space

management and design process. Involvement of different stakeholders at each stage of the design process can provide robust and useful information; patients value services and comfort, while staff prioritise hospital standards and functional practicality. Staff added that the hospital should provide clear guidelines for building life-cycle and establish concrete renovation, expansion, and demolition plans.

Category 3.2: Hospital waiting area

Sub-category 3.2.1: Current condition and characteristics of waiting area

Patients mentioned that waiting areas are often located in building circulation, some areas are unhygienic, and that many do not support all patient profiles. Medical staff described that hospital buildings are outdated, as they were built in the 1970s and are still in use. Waiting areas are not welcoming, and they do not offer a relaxed atmosphere, as the areas were not intended to be used as waiting areas. The staff added that hospital waiting areas were not integrated into the hospital planning process; however, they felt that both treatment and waiting areas should be equally considered in the process, as both types of areas are important for the patient care journey.

Sub-category 3.2.2: Suggestion for improvement

Patients and staff mentioned five core components, which are: **(1) Control.** Patients described that they had control over their medical journey as the hospital provided them with useful information. However, patients and staff requested that every clinic should provide queueing information and information about treatments and disease in waiting areas. Moreover, patients suggested that the hospital should provide choices of seats, including individual or group seating areas. **(2) Comfort.** Patients mentioned that comfort is the most important aspect for long waits. They added that waiting areas can be more welcoming, offering a choice of comfortable seats, privacy, and beverages. **(3) Hospital standards.** Staff expressed that hygiene is the most important aspect, and that patient profiles, hospital function, and hospital standards should be valued over aesthetics; there should be a balance between comfort and standards. **(4) Access.** Both groups of participants preferred easy access to the nurses' station. Patients requested access to natural light and an outside view, as these provide a relaxing and calming atmosphere (especially in the winter time); staff added that a relaxing and calming atmosphere has an impact on patient mood, as patients tend to listen to staff advice more when they are relaxed. **(5) Waiting area typology and supporting facilities.** Two types of areas were suggested here. First, areas for long waits, where comfort and privacy should be integrated in the areas. Second, areas for short waits, which can be located in the building circulation. Staff stressed that supporting facilities, such as hospital cafés or canteens, can be used as waiting areas, along with patient pick-up areas.

Denmark Theme 4: Patients' needs and patient-focused approach

Medical staff described two different meanings for the terms patient needs and patient-focused approach. Patient needs form the core of hospital services, and include treatment and follow-up plans that involve useful information, while the patient-focused approach is caring for patients individually and providing them with the feeling that they are being seen and expected. They added that the patient-focused approach is a balance between patient expectations, hospital functions, and practicality.

Denmark Theme 5: Social structure

Patients described that they had a good relationship with trusted medical staff who understood their life situation and encouraged patients to keep up with their career and routines as a distraction from illness. Patients added that low social status leads to comfort with discussing their life situation with staff as well. Medical staff mentioned that they are aware of every patient's circumstances and acknowledged that most patients were stressed while waiting. Staff added that they valued patients' normal routines and encouraged them to keep up with their normal lives.

5. Discussion

5.1 Waiting areas' physical conditions, characteristics, and their effect on patient care journey and waiting experience

Both hospitals provided similar characteristics in their waiting areas; however, the hospital standards of the areas were different. Our findings showed that the two hospitals share five similar types of waiting areas (Authors, 2018), and areas located in building circulation, including corridor waiting areas, are the most commonly used in both hospitals. In our study, both patients and staff felt that waiting areas located in building circulation have a negative effect on the patient care journey and patient waiting experiences because the area does not provide patients with comfort or privacy, and they felt that corridor areas are not suitable for long waits. Based on the existing theory of EBD and healing environment (Ulrich et al., 2008), corridor waiting areas do not promote patient comfort or contribute to a positive patient journey and waiting experience.

5.2 Factors that have an effect on patient care journey and waiting experience, according to patients and staff

Our major findings highlight the factors that influence patient care journey and waiting experience. The interviews revealed that the hospital's physical environment, including waiting-area quality, is not the first priority for patient care journey and waiting experience. However, patients and staff valued two factors: (1) structure and organisation of the healthcare system (2) hospital management and service system. Findings from this study contribute to the existing knowledge of hospital space management and design of non-clinical areas, highlighting that patient care journey and waiting experience do not only depend on architectural quality and design of hospital, but also on the holistic views of several factors, especially healthcare services.

Figure 3 illustrates the layer of factors that have an influence on patients' care journey and waiting experiences based on Thai/Danish patient and staff opinions and experiences. According to Figure 13, the structure and organisation of the healthcare system and the hospital management system have the strongest impact on patient journey and waiting experience. These act as fundamental layers for healthcare services and govern the number of patients in public hospitals. Effective patient journey and positive patient experience resulted from well-managed and organised hospital services that integrate patients' perceptions into hospital service design (Simonse et al., 2019; Nenonen et al., 2008). Therefore, patient-focused approaches and the patients' needs factors have to be considered throughout hospital services design (Simonse et al., 2019; Nenonen et al., 2008).

Hospital space management and planning has less impact on patient journey. This factor consists of five core components (user involvement, patient needs, organisation of clinic, building planning, and hospital function) this finding contributes to the existing knowledge of EBD theory, healthcare environment and patient stress concept, where a hospital's physical environment can have an impact on patient health and well-being (Hamilton and Watkins, 2004; Becker and Parsons, 2007; McCollough, 2009). The physical environment of the waiting area does not have as strong an impact on patient care journey and waiting experience. However, the five core components (control, comfort, access, hospital standards, and waiting area typology) should be taken into consideration during the design of hospital waiting areas. Thus, this finding adds to existing knowledge of hospital design (An  ker et al., 2019; Patterson et al., 2017; Becker and Douglass, 2008), as new components (waiting area typology and requirement for waiting area design) emerged during the analysis of this study. Hospital space management and physical environment are factors that facilitate efficient patient journey and waiting experience.

Social structure has an influence on patient waiting experience, as social structure provides useful information for the design of waiting areas in each context (Thailand and Denmark) and should be considered during the design process of the hospital.

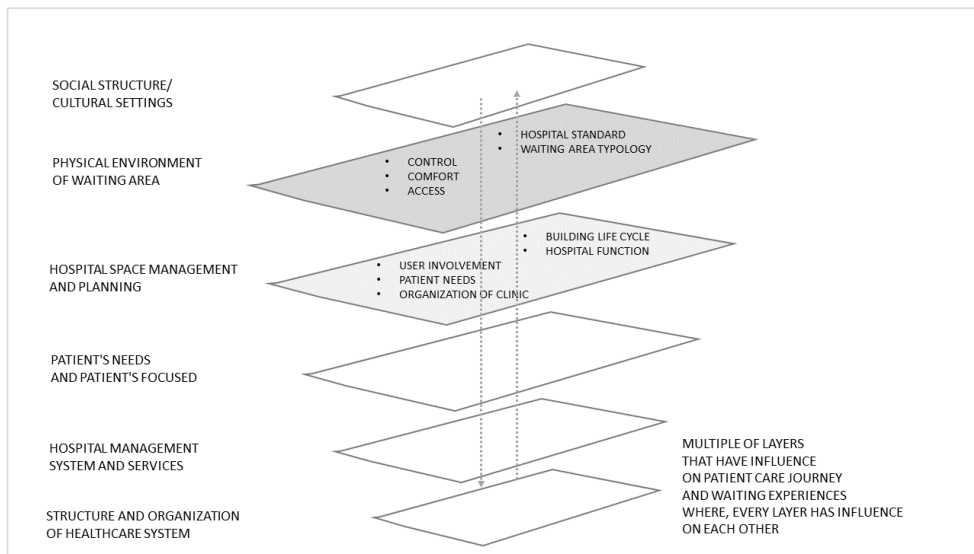


Figure 3: Factors that influence patients' care journey and waiting experiences, based on opinions of Thai and Danish patients and medical staff.

5.3 Differences and similarities between Thai and Danish medical staff and patients' opinions and experience

Healthcare system: Thailand and Denmark have different healthcare systems, although Thailand adopted universal health coverage in 2002 (Limwattananon et al., 2012). This scheme has significantly improved access to medical treatment and services among low-income, vulnerable, marginalised, and rural groups of people. This has led to a high demand for medical treatments; however, healthcare resources are still low, especially in rural areas (Limwattananon et al., 2012). Furthermore, the Thai healthcare system does not provide local GPs who could act as medical gatekeepers for specialised large public hospitals (Authors, 2019). The lack of local GPs and poor primary care service, together with the universal coverage scheme, have led to a high number of patients seeking treatment in large public hospitals.

By contrast, Denmark has a decentralised healthcare system, which provides clear classification of hospitals and healthcare services (Olejaz et al., 2012; Ministry of Danish Health, 2017). Responsibilities for primary and secondary healthcare lie in regions and municipalities (Olejaz et al., 2012), and each public hospital provides a different type of specialised treatment. Therefore, every patient is assigned a specific local GP, who has the sole responsibility for the patients assigned to the practice (Strandberg-Larsen et al., 2010). Moreover, the implementation of the Danish online health portal allows patients to access important information, offers centralised patient data, and provides data transparency to patients (Danish eHealth Portal, 2020).

Healthcare management system: Thailand and Denmark have implemented different healthcare management systems and services. For Thailand, a lack of organised services was reported by patients and medical staff, including a lack of (1) long-term management and planning, (2) expertise and knowledge regarding hospital planning, and (3) screening of processes and organised queueing management system. Most patients expressed negative feelings about coming to hospital as they found it time consuming due to the slowness of service and lack of queueing information. This is aligned with previous studies (Norman, 2009; Jones and Peppiatt, 1996; Maister, 1985), where waiting experiences at hospitals were found to be stressful due to the uncertainty of the patient's

health situation and lack of information. Therefore, it is necessary for hospitals to minimise the uncertainty of waiting times, reassure patients that they will be seen, and given certain expected waiting times throughout their hospital visit (Norman, 2009). By contrast, Denmark provides organised hospital services that offer useful information and where a user-focused approach has been implemented in hospital services. Since 2003, Denmark has been using patient involvement as part of a national-level healthcare service quality assurance programme, where patient involvement is integrated into hospital services and planning (Vrangbaek, 2015). As part of this, in 2017, Rigshospitalet introduced a design guideline *Design Manual*, which was implemented in the renovation of hospital waiting areas (Authors, 2019b). Information used in the Design Manual was based on patients' involvement and needs. The manual offers one way of implementing a patient-involvement approach.

Hospital space management and planning process – what can both hospitals learn from each other:

The Thai and Danish hospitals are experiencing similar situations, as both hospitals are outdated and many waiting areas were not integrated into the original design processes. Both hospitals are dealing with an increasing number of patients, and non-clinical areas have been changed to clinical areas to support the high demand for medical treatments. Regarding the similar situations that both hospitals are facing, each hospital can exchange information related to their problems and solutions to avoid precedent circumstances. Based on these findings, suggestions for hospital planners and facilities manager for both countries are (1) hospital function and hospital accreditation standard are the most important aspects in design process, (2) user involvement should be employed during the design process, balancing between practicality, functionality, patient profiles, and patients' needs, and (3) provide clear guidelines for a building's life-cycle. These topics are in line with other studies related to patient expectations (Anåker et al., 2019; Patterson et al., 2017; Fronczek-Munter, 2016). Five core components of the waiting area design framework emerged from the analysis. As shown in Figure 4, the core components are: (1) *control* – patients would like to have control over their journey, waiting time, and useful information; (2) *hospital standards* – hygienic, cleanliness, safety, and level of noise; (3) *access* – location of nurse's station, access to greenery, view of outside, daylight, and access to supporting facilities; (4) *area typology* – area where patients wait during medical processes, area where patients wait after medical processes, and supporting facilities; and (5) *comfort* – privacy, personal space, relaxed atmosphere, positive distraction, drinks, and comfortable seats. The design framework of waiting areas is aligned with the theory of quality of care and the physical environment described by Arneili and Devlin (2002), where the design of outpatient waiting-room environments influenced patients' perceived quality of care (Anåker et al., 2019; Patterson et al., 2017; Becker and Douglass, 2008).

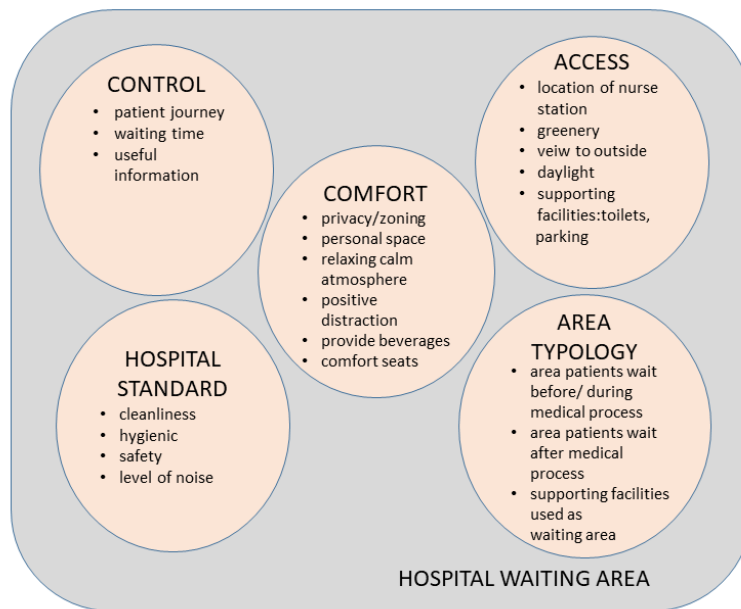


Figure 4: shows criteria required for waiting area design to optimise patients care journey and waiting experience

Patient-focused approach from the perspective of medical staff: Thai and Danish medical staff are fully aware of the concepts of patient needs and patient-focused approach. They provided different meanings for each of the terms. Patient needs are the basic needs of patients toward hospital services, including getting better, being diagnosed, being followed up, and being stable. A patient-focused approach is a concept in which staff focus on each individual patient's needs, circumstances, and life situation. The concepts of patient need and patient-focused approach are aligned with knowledge of the patient journey and hospital services, where patients' needs and expectations regarding every medical process, from entering the healthcare service until they are discharged, are considered (Simonsen et al., 2019; Reay et al., 2017; Richardson et al., 2007).

Social structure: According to findings, Thai patients are accompanied to their hospital visits by three to four family members, which is one of the reasons for overcrowding in hospital waiting areas. Thailand is considered to have a highly collective culture, where people are integrated into strong cohesive in-groups, which gives them a sense of security (Rirattanaphong, 2014; Hofstede et al., 2010). Half of the patients accepted the current conditions of the hospital physical environment, as they felt that complaining could lead to conflict and might lead to slower services from staff. This finding is aligned with the culture of confrontational avoidance of Thai people, where an offence leads to a 'loss of face'; Thais are very careful not to offend anyone in front of their group (Hofstede et al., 2010; Mulder, 2000; Deveney, 2005). Thai staff also mentioned that they care for patients individually. This finding relates to another type of Thai value, where interpersonal moral values are held in high regard, which means that 'grateful', 'caring', 'forgiving', 'obedient', and 'mutually dependent' are considered important. On the other hand, Danes value the power of sharing, trust, and participation (Grenness, 2003; Hofstede et al., 2010), which is aligned with our findings, which showed that patients had a good relationship with staff and that staff understood their life situation. Danes also value being unprejudiced and keeping up with normative thinking; therefore, medical staff encourage patients to keep up with their normal routine and jobs (Hofstede et al., 2010).

Equality among Danish people is also important with low value given to power distance, and as consequence, the hierarchy is rather flat (Hofstede et al., 2010; Grenness, 2003), which matches perfectly with our findings showing that patients felt that they could easily discuss personal life matters with staff for consultancy and solutions. Informality is also integrated into Danish social norms; therefore, patients accept longer waiting times due to emergency cases (Grenness, 2003).

6. Conclusion

This study provides insights regarding the architectural qualities of non-clinical areas and outlines waiting area typologies in the Maharaj Hospital and Rigshospitalet. Maharaj Hospital failed to meet the minimum requirements of hospital accreditation standards, while Rigshospitalet focused on patient needs. Five waiting area typologies were described: (1) large waiting area, (2) food place and cafeteria, (3) waiting area located in building circulation, (4) waiting area inside the clinic with a nurse's station, and (5) an unplanned waiting area. Interviews with patients and medical staff were conducted to explore patient and staff opinions toward patient journey and waiting experiences. Insights from analysis of the interviews supplemented questions raised during the analysis of the walk-through evaluations of both hospitals. Five different themes emerged from the interview analysis, where structure and organisation of healthcare services and hospital management system and services play the most important role in patient journey and waiting experiences, as these two factors determine the number of patients in the hospital. Hospital space management and quality hospital waiting areas can lead to a positive patient journey and waiting experiences. However, these two factors are not the first priority, according to the interviewees. Medical staff are fully aware of patient needs and patient-focused approaches, including user involvement, as these two components can contribute to effective waiting areas that fit patients' expectations and profiles. Thailand and Denmark have different cultures, and this can impact the number of patients in a hospital, further impacting patient and staff perspectives; nonetheless, culture can provide useful information for future hospital design processes. This study emphasised the evaluation of hospital waiting areas, along with users' perspectives and their experience of using the hospitals' waiting rooms. These findings specify information that can be useful for hospital planners and facilities managers for future investment in retrofitting hospital waiting areas that will lead to positive patient and staff experiences.

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Appendix 6

List of other publications

LIST OF OTHER PUBLICATIONS

Conference

Prugsiganont, S. and Jensen, P.A. (2017) 'Defining specific problems in the Thai government hospital buildings. A study of architectural planning and space management of Maharaj Hospital, Chiang Mai Thailand'. In *Proceedings of the IRWAS 2017 Conference*, Salford, UK, 11-12 September 2017.

Non-scientific publications

Prugsiganont, S. (2018) 'How important are patient needs? The design manual of Rigshospitalet Copenhagen main hospital' in *European FM insight*, vol 46 page: 44-46

Prugsiganont, S. (2018) 'Think beyond standard healthcare to improve patient well-being' in *European FM insight*, vol 45, page: 46-50

Balslev, S.N, Prugsiganont, S., Fronczek-Munter, A., & Waroonkul, T., (2018) 'We need a masterplan for real estate and facilities management! Ambition of change at the Faculty of Medicine Chiang Mai University Thailand in *European FM insight*, vol 43, page 8-11.

Appendix 7

List of meeting and data collection

Table 7-1: List of presentation and empirical data collection

Date	Task	Place
2017		
August	Two-weeks field work observation at St Olavs hospital and two weeks of external research stay at NTNU	Trondheim, Norway
September	CIB World congress - I presented research paper at the conference <i>'Defining specific problems in the Thai government hospital buildings. A study of architectural planning and space management of Maharaj Chiang Mai Hospital, Chiang Mai Thailand'</i>	Salford University, the UK
November	Kick start meeting with Rigshospitalet hospital planner for observing and registering waiting areas Rigshospitalet Start collecting investigating waiting areas Rigshospitalet Blegdamsvej	Copenhagen, Denmark
December	Investigating waiting areas Rigshospitalet Blegdamsvej	Copenhagen, Denmark
2018		
January	Investigating waiting areas Rigshospitalet (continue)	Copenhagen, Denmark
	Pilot study at three hospitals (secondary case study) Maharaj Chiang Mai hospital, Chulalongkorn hospital, Khoo Teck Puat hospital (Singapore)	Thailand, Singapore
February	continue pilot study at three secondary case study CFM 10- year anniversary conference I presented my research topic <i>'Investigating public hospital non-clinical areas'</i>	Thailand, Singapore DTU, Kgs Lyngby, Denmark
May	SARCH2018 -Present research paper at the conference 'Exploring hospitals non-clinical areas in three continents'	Venice, Italy
June	CFM group seminar where I presented my current progress of research topic <i>'Waiting area in public hospitals'</i> Present my PhD research topic at the Capital Region of Denmark	DTU, Kgs Lyngby, Denmark Herlev, Denmark
July	Presentation current research topic at architectural conference - Athens Institute for Education and Research	Athens, Greece
August	Involved in actual waiting areas renovating project at Rigshospitalet	Copenhagen, Denmark

Table 7-1 (continue)

September	Involved in actual waiting areas renovating project at Rigshospitalet	Copenhagen, Denmark
October	Meeting with nurses	Rigshospitalet Blegdemsvej Copenhagen, Denmark
	Begin interview with patients Rigshospitalet	
November	Continue the interview with patients from Rigshospitalet	Copenhagen, Denmark
	CFM - researcher seminar where I presented my current progress of PhD study ' <i>User-involvement in design process and the next step of the PhD study</i> '	DTU, Kgs Lyngby, Denmark
December	Thorough observation at Maharaj Chiang Mai hospital	Thailand
	Interview with Maharaj Chiang Mai hospital and medical staff	
2019		
January	Continue interview with Danish patients and medical staff at Rigshospitalet	Copenhagen, Denmark
February	Continue interview with Danish patients and medical staff at Rigshospitalet	Copenhagen, Denmark
March- May	External research stay at Cornell university	Ithaca, USA
	Present my research topic to colleagues at the Health Innovation Design Lab	
June	Continue interviews with Danish medical staff	Copenhagen, Denmark
	ARCH19 - I present my research paper 'Through the eyes of nurses: user-involvement in design process'	NTNU Trondheim, Norway
September	Teaching assistant Facilities Management guest lecture during the class, where I presented my PhD research topic	DTU, Kgs Lyngby, Denmark
October	Observing and registering Rigshospitalet Glostrup waiting areas	Glostrup, Denmark
	Complete empirical data collection	

Appendix 8

Example of Rigshospitalet waiting area registration form and Sketch of the waiting area

D. 5011

Onkologist Klinik

Fg deang
Sengeaenit
(2.5) Finsenthet

14/12/2017

Element	Photo	Remarks
INFORMATION / support for way finding		
Wayfinding	① ② ③	
Signage to toilet	doesn't say that it is a waiting for onkologist so I'm not sure if I'm at the right spot. It's almost impossible not to ask where is the spot. no sign!	
Signage to water	no	
Information boards		
Displays	✓	
FACILITIES		
Drinking water fountain		
Drinking water trolley	no	only the jars / Jucks in the fridge.
Coffee/tea	yes	
Refrigerator food	yes	but only yoghurt drinking
Display for magazines		
TV	yes	
Info screen	yes	
Art	no	but off
Sound / noise	good	
Smell	good	
CLEANING / HYGIENE		
Dishes	ok	
Waste containers	ok	
Dispensors for	ok	- organic waste - bottles.

Appendix 9

Themes, categories, sub-categories and quotes from the interviewed participants

Table 9-1: Emerge theme, categories, sub-categories, and details of interview analysis comparison between Thai and Danish patients/medical staff

Thailand	Denmark
Theme 1: Structure and organization of healthcare system	
Category 1.1: Incongruence between healthcare resources and medical treatment	Category 1.1: General problem of healthcare system
Mentioned by	
Patient <ul style="list-style-type: none"> High number of patient lead to time consuming when coming to the hospital Medical staff <ul style="list-style-type: none"> High number of patient with limited healthcare resources lead to the lack of space in the hospital Hospital is taking patients more than its capacity and lead to high amount of work load to medicals staff Patient and medical staff <ul style="list-style-type: none"> High number of patient with high demand for medical treatment with lack of resources <p><i>'We have around 1.5 million patients yearly this is only outpatient, which means 7,500 patients daily and 130 patients per medical doctor. This add so much workload to us, staff, hospital is taking patient more than it's supposed to be'</i> C- Medical staff</p>	Patient and medical staff <ul style="list-style-type: none"> High demand on medical treatments is a major problem in the hospital Patients from other region are transferred to national hospital for complicated diseases leading to high number of patient and requirement of more space
Category 1.2: Centralized healthcare service	Category 1.2: Distribution of Danish healthcare facilities
Mentioned by	
Patient <ul style="list-style-type: none"> Lack of healthcare service including insufficient healthcare distribution in rural areas Not enough community hospital, leading to high patient numbers and overflowing at the large public hospital Lack of gatekeepers or general practitioner (GP) lead to high number of patient Medical staff <ul style="list-style-type: none"> De-centralized healthcare system or organized hospital according to the diseases would help reducing number of patients <p><i>'We don't have decentralized system so, everyone comes to Maharaj hospital. It's really over capacity.....' K-Medical staff</i></p>	Patient <ul style="list-style-type: none"> Denmark established a clear classification of hospital healthcare services, where GPs acted as hospital gatekeepers, GPs gave primary treatments reducing number of hospital patients Each hospital provided different type of specific treatments and specializations, creating an equal distribution of patient across the public hospitals Healthcare system prioritized treatments of highly fatal and severe diseases, including organ failure and oncology. <p><i>'If you are acute, you will go to the hospital..... if your case is severe or needs a specialized doctor, your journey will be GP and the hospital, and the hospital will start talking with you whether you need to come</i></p>

	<i>for dialysis or treatment....Sometimes when you are stable, you go back to GP' M-dialysis patient</i>
Category DK 1.3: Implementation of an online medical service platform	
Mentioned by	
Patient	
<ul style="list-style-type: none"> Online healthcare platform (Sundhed.dk) has been employed by the Danish healthcare system (Danish eHealth portal, 2020) to centralized patient medical information Online platform allowed data transparency, where patients can access their medical record and other healthcare services, such as online scheduling with specialized medical consultants 	
<i>'If compare the Danish and Thai healthcare system. Denmark has a better system because the information is centralized. Everything is online, including my medical journey, doctor's comment etc. No matter which hospital I go to, the doctors can just go back to my previous medical records because everything is uploaded in the system, and it is very transparent.'</i> M-oncology patient	

Theme 2: Hospital management system	
Category 2.1: Lack of long term management and planning	Category DK 2.1: Organize hospital service providing useful information
Mentioned by	
Patient and medical staff	
<ul style="list-style-type: none"> Lack of long term management and planning to estimate building capacity for future expansion The development of hospital is lack of long-term plan for architectural, master planning, and direction of future treatment and technologies 	
Patient	
<ul style="list-style-type: none"> Useful information is provided for patients, appointment details is sent via telephone texts and e-mails. Map is always attached to the e-mail for the first appointment Information center was easily accessible at the entrance, and signage was in the main intersection in the hospital 	
Category TH 2.2: Lack of screening process and organized queueing management system	Category DK 2.2: Implementation of user-focused approach and change in hospital service
Mentioned by	
Patient	
<ul style="list-style-type: none"> Lack of proper screening process at the hospital leads to high number of patient as everyone can 'walk-in' without having an appointment 	
Patient	
<ul style="list-style-type: none"> Their need and opinion were heard and considered when modifying the hospital 	

- Unorganized screening process lead to high number of patients and extremely slow service, where the hospital does not prioritize the urgency of disease. Many un-urgency cases could have been to local hospital instead of large national hospital

system and service to fit each patient's schedule and circumstances

'A positive thing about the Danish healthcare services is that they try to be as informative as possible. It means they try to think from patient's perspective as much as possible. If you look at dialysis in Denmark in general, medical staff always ask, 'What can I do for this person to live a normal life as much as possible?' M-dialysis patient

Medical staff

- Technology including online screening process and queueing system can help reduce number of patient
- Online registration could be used to skip intake process patient can come directly to outpatient clinic with approximate waiting time

'Another improvement that we can do for this hospital management system is using technology for patient screening process. Patients can register online and skip intake process and they can come directly to OPD clinic which accurate time sloth. This can decreases high number of patients who are waiting for screening process in front of OPD clinic.' K-Medical staff

Medical staff

- The term patient -centered approach was used in the hospital as the term doctor will see you now has changed to doctor will come and get you now, which gives more sense of equality to patients

Patient and medical staff

- Hospital fail to provide useful information regarding queueing system
- Long waits patient are bounded to wait at the clinic waiting areas due to the lack of queueing information

Theme 3: Hospital space management and planning process	
Category TH 3.1: Overall physical environment	Category DK 3.1: Overall physical environment
	Mentioned by
	Patient and medical staff <ul style="list-style-type: none"> • Hospital has limited space due to high number of patient and high demand of medical treatment • Non-clinical areas are not the first priority of hospital planning, some of the areas turned into treatment rooms or storage rooms for medical treatment

Sub-category TH 3.1.1: Current condition of hospital physical environment	Sub- category DK 3.1.1: Suggestion for hospital design process
Mentioned by	
<p>Patient</p> <ul style="list-style-type: none"> • Unorganized clinics lead to extremely long queue at the elevator • Location of related clinics are located in different building effecting patients experience and their medical journey causing time consuming <p><i>'Some of the administrative offices should be upstairs, but they are all located on the first or second floor. All the outpatient clinical area upstairs, so the queue all the elevator is really long, especially in the morning. You need to pick up a queue number at the elevator just to get on one. And the patients use the elevators unnecessarily.'</i> N-patient</p> <p>Medical staff</p> <ul style="list-style-type: none"> • Crossing circulation between service/staff flow and patient flow which can be unhygienic and against hospital accreditation standard 	<p>Medical staff</p> <ul style="list-style-type: none"> • Successful user involvement leads to areas efficiency that fits to patients and staff expectation, patient profiles, and hospital function • Hospital function and standard is the most important aspect of design process, designer sometimes value aesthetic over hospital standard , where highly aesthetic furniture and areas is often lack of hygienic and comfort • Number of patients should be estimated and prepare for future expansion <p><i>'I think from my own perspective, as a staff, I think we are very aware of patient's needs and I think brining in both patients and staff for the design process might not work, too much information - maybe we can tur n in the design involvement Maybe you can ask patients first and then later ask us, we have more insights, where patients didn't really think about.'</i> A- medical staff</p>
<p>Patient and medical staff</p> <ul style="list-style-type: none"> • Hospital buildings are obsolete as two of main buildings were built in 70s and are still in use • All five building have been through several expansions and renovations, many clinical and non-clinical areas were ad-hoc empty spaces. Therefore, design of the areas does not match with the original purpose • Unorganized clinics and wards, where administrative offices locate on lower floors while important outpatient clinics locate on higher floors. 	<p>Patient and medical staff</p> <ul style="list-style-type: none"> • User-involvement is one of the most significant keys for a successful space management and design process • Patient and staff have different point of view, where patient value services and comfort while staff prioritize hospital standard including safety, hygienic, and functional practicality • Different involvement of stakeholder on each stage of design process can provide robust and useful information • Clear guideline of building life-cycle including establish a concrete for renovation, expansion, or demolition • Hospital physical environment has less impact on patient medical journey whereas hospital service and treatments have stronger impact on patient journey and waiting experiences

Sub-category TH 3.1.2: Problem regarding hospital design process
Mentioned by
Staff

- Never been asked to give any comments for the clinical renovation and when the clinic was remodeled it fail to meet hospital hygienic standard
- Lack of record of patient data, where the record of patient data and profile is important for hospital development as patient data give insights and can be used for the design of entire hospital

'I think user involvement is very important, here patients are end user but, us staff are also users. Now, people who are using the area never get a chance to design and people who design the area never actually step foot in the clinic, that's why it doesn't work.' T- Oncology nurse

Patient and staff

- Lack of user involvement and patient focused approach in the design process
- Lack of expertise and knowledge in hospital planning and facilities management, including failures to involve different stakeholders in each stage of the design process
- Lack of knowledge lead to unorganized clinic, confusing hospital navigation, failure to meet hospital accreditation standard, and incompetence hospital function

Sub-category TH 3.1.3: Suggestion for improvement
Mentioned by
Medical staff

- Hospital function and hospital accreditation standard are the most important aspects for space management, staff added that many renovated and new areas designers focused on aesthetic rather than function. Moreover hospital space management and planning should be based on service and patient flows as main part of hospital function.
- User-involvement (staff involvement) should be employed for the planning process as staff provides insights that often are overlooked by hospital planners or designers
- The organization of the related clinical and non-clinical areas should be located nearby each

other. For example, laboratory and x-ray should locate in the same area. Supporting facilities such as, restrooms, café, parking garage should be days to access for vulnerable group of patients

- Hospital should provide clear guideline for building life cycle, which includes planning for renovation and expansion. Hospital areas should be flexibility for future expansion.

'It has to be clear guideline of building life span especially healthcare building - how many year before renovation and how many year before it become obsolete, which part of building is permanent, temporary, and so on.' U- Medical staff

Patient and staff

- Patient-focused concept prioritizing patient needs should be employed during the design process, where patient's privacy and comfort for long waits have never been considered during hospital space management and planning

Category TH 3.2: Hospital waiting areas	Category DK 3.2: Hospital waiting area
Sub-category 3.2.1 TH: Current condition and characteristic of waiting areas	Sub-category 3.2.1: Current condition and characteristic of waiting area
Mentioned by	Mentioned by

Patient

- Hospital should avoid corridor waiting areas due to lack of privacy and high level of noise
- Low privacy due to building circulation waiting areas and lack of clear zoning between public and private zones

'Good waiting area should not locate in corridor because there is no zoning and you're sitting in building circulation, where people walk around and pass you. Many waiting areas are sharing the areas it's too busy it should be private in a proper room.' W- patient

Medical staff

- Waiting areas and non-clinical areas were not part of the design of hospital lead to building circulation waiting area
- Hospital planner, designer, and facilities managers focus more on clinical areas and treatment room rather than waiting areas. Thus, medical staff argued that non-clinical areas are important as it is part of patient care journey.

Patient

- Waiting areas often locate in building circulation, some areas are lack of hygienic and does not support all patient profiles
- Lack of prioritizing waiting areas in hospital design process, patient's comfort and privacy are often excluded

Medical staff

- The buildings are obsolete as they were built in the 70s and waiting areas were not integrated in the design processes. Many waiting areas were not intended to be used as waiting areas
- Both treatments and waiting areas should be equally considered during the design process as both are important. Hospital

- Many waiting areas does not support every type of patient profiles, including vulnerable group of patients. Moreover, many areas does not meet hospital standard in term of safety and hygienic.

usually prioritize treatment room rather than waiting areas

- Waiting areas are not welcoming and lack of relaxed atmosphere

'I think one problem is that waiting areas here were not intended to be used as waiting area, most of our areas here are corridor areas. The aspect that designer always ignore when designing waiting areas is they only focus on treatment areas rather than waiting areas. So, the areas are not friendly and small.' B-medical staff

Patient and Medical staff

- Lack of established clear zoning between clinic's waiting areas and lack of proper waiting areas. Many waiting areas are open large area with benches or waiting area placed in building circulation. For example, corridor waiting areas

<i>Sub-category 3.2.2: Suggestion for improvement</i>	<i>Sub-category 3.2.2: Suggestion for improvement</i>
Mentioned by	
Patient and staff	Patient and staff
Control <ul style="list-style-type: none"> • Patient is still lack of control and wanting to be able to control their care journey and waiting time by providing a pick-up and drop-off services together with information about approximate waiting time, especially long waits. <p><i>'I waited for the doctor 2-3 hours, sometimes the nurse told me to come back after 13.30 we go out and get some food and then come back to the clinic. So, it would be really better if I know approximate waiting time before my queue.'</i> P-patient</p>	Control <ul style="list-style-type: none"> • Patients had control over their medical journey as the hospital provide uncomplicated navigation and facilities for vulnerable patients • Queueing information has impact on patient journey and waiting experience as queueing information gave patient freedom and control over their life • Hospital should provide information relating to patient diseases or treatment process. For example a quick response code (QR), where patient can scan and read about the information via their mobile phones • Queueing time and number should be provide in every clinic • Choice of seats and zoning should be provided, group of seats or individual seat
Comfort <ul style="list-style-type: none"> • Patient and staff mentioned that patient's comfort should be integrated in the design of hospital waiting areas • Hospital should provide privacy and personal space in the waiting areas with different waiting zone creating relax and calm atmosphere • Hospital waiting areas should accommodate welcoming atmosphere by providing positive distraction (Wi-Fi, magazines), beverage, and comfortable seats for long waits. 	Comfort <ul style="list-style-type: none"> • Patient express comfort is the most important aspect for long waits • Waiting areas should be welcoming by providing comfort seats, drinks

Hospital standard

- Four aspects were mentioned (cleanliness, hygienic, safety, and level of noise). Most important aspects area cleanliness, hygienic, and safety
- Hospital should concern mostly about air quality for ventilation and infection control

Access

- Location of nurse station should provide an overview of the whole waiting area, where patient and staff can have easy access to each party. For example, staff have over all view of patients when they are in waiting areas

Waiting area typology and supporting facilities (only mentioned by medical staff)

- Two types of waiting areas should be integrated in the future design of waiting area (1) areas where patients wait for/during medical process, these areas used by family of patients, these areas should provide information about waiting time (2) areas where patients wait after medical after medical process, these areas should provide some positive distraction and comfort

'Waiting areas divided into two separate purpose; first is the waiting area where patients wait to see medical staff or any activities that involve medical treatment. Another purpose is the area where patients wait after the medical treatment has ended. They wait to be picked up or to buy medicine or family waits around to see patient in the inpatient ward.' U-oncology medical staff

- Hospital should provide zoning together with comfort seats could increase privacy in waiting area
- Waiting areas should be simple waiting comfort seats and zoning with privacy
- Avoiding long rolls of seats

Hospital standard

- Hygienic is the most important aspect
- Patient profiles, hospital function, and hospital standard should be valued over aesthetic - balancing between comfort and standards

Access

- Location of nurse station, where medical staff see the overall view of the waiting areas while patients can get easy access to staff
- Access to nature light, outside view, and nature to give relax and calm atmosphere. Patient added daylight and view to outside is necessarily during the winter in Denmark
- Staff mentioned that relax and calm atmosphere has effect on patient mood, which has direct impact on staff work. Patients tend to listen to staff advice more when they are relaxed

'For our clinic (ultrasound ward) waiting area is the place, where patients with their partner....and they might be a little afraid or tired or tense. They might be sick so it's good if the waiting area is comfortable and you can relax a bit and there is a little personal space, so you don't sit too close to other people.' A- medical staff

Waiting area typology and supporting facilities

- Patient and staff suggested waiting areas types (1) long waits areas should provide comfort seats, zoning and privacy (2) short waits can locate in building circulation
- Patient pick-up area is also considered waiting area, where comfort, privacy, and hospital standard should be implemented in the area
- Supporting facilities (café, restaurant, library) can be used as waiting area

- Danish public hospital should provide pharmacy in the hospital
-

Theme 4: Patient's needs and patient focused approach	
Mentioned by	
Medical staff	
<ul style="list-style-type: none"> • Patient needs are the core of hospital services as patients want to be treated , get better, to become stable, and to receive fast service • Patient-focused approach goes beyond medical treatment and services as patient focused approach involve with patient's circumstance and understanding patient's life situation • Hospital needs to position itself as a service business and balance the expectation between patient and staff <p><i>'Patient needs and patient-focused approach are different topics. Patient needs are that they want to get better, but medical staff have to consider what is the best plan or solution for them. We cannot follow all their needs.... On the other hand, patient-focused approach is to focus on patient individually, patient profiles and their life situation.'</i> S-medical staff</p>	<ul style="list-style-type: none"> • Patient needs and patient-focused area different • Patient needs are hospital services, treatments plans, and useful information including follow-up plans • Patient-focused approach is to care for patient individually and they are being informed with useful information. Patient should feel that they are being seen and expected • Patient-focused approach is a balanced between patient expectation, hospital function, and practicality <p><i>'Getting better or being treated is the first priority of patients' needs, that's why they are in hospital. And if the waiting areas are looking good and clean is one-plus.'</i> L-dialysis medical staff</p>

Theme 5: Social structure	
Mentioned by	
Patient	Patient
<ul style="list-style-type: none"> • Healthcare staff mentality has positive impact on their waiting experiences as they received good services and care from staff as it compensated hospital slow services, unorganized system, and poor physical environment • Accept hospital current condition because patients prefer to have smooth interaction with staff, complaining about hospital services and physical environment might raise conflict and lead to slow services 	<ul style="list-style-type: none"> • Good relationship with trusted medical staff who understood their life situation • Staff encourage them to keep their career and routine as distractions from illness • Low social status leading to comfortable to discuss their life situation with medical staff • Accepting unexpected long waiting time due to emergency case <p><i>'I don't know about other cultures but, here in Denmark you'll find out that everyone that has a serious diseases they try to keep working as long as possible. Keep up the normal, be as normal as possible.'</i> B-patient</p>

Medical staff

- Patient is always accompanied by 3-4 family member for social support lead to high number of people in waiting areas
 - Are willing to provide the best care and service to patient to compensate the poor services and physical environment of the hospital
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Medical staff

- They are aware of patient's circumstances and realized that most patients are stressed and in limbo
- Value patient's normal routines and encourage patient to keep up their normal life and routine

Curriculum Vitae



Supuck Prugsiganont was born and raised in Chiang Mai, Thailand. She graduated as an architect in 2008 and spent her internship year as a junior architect in *Sasaki Associate* Boston, USA. From 2009 to 2012, she received her Master of Architecture from Faculty of Architecture Chiang Mai University.

From 2012 to 2013, she worked as an architect before joining the Faculty of Architecture at the institute she obtained her bachelor and master's degrees. She is currently holds a permanent position as a lecturer teaching architectural design at the Faculty of Architecture with an on-leave to pursue doctoral education.

Supuck has an interest in the design of public buildings especially hospital architecture. In 2015, she began her PhD journey in the Netherlands. However, in 2017, she switched the institute and moved to the Center of Facilities Management, DTU where she began working under the supervision of Prof Per Anker Jensen.