Restorative green outdoor environments at acute care hospitals - case studies in Denmark

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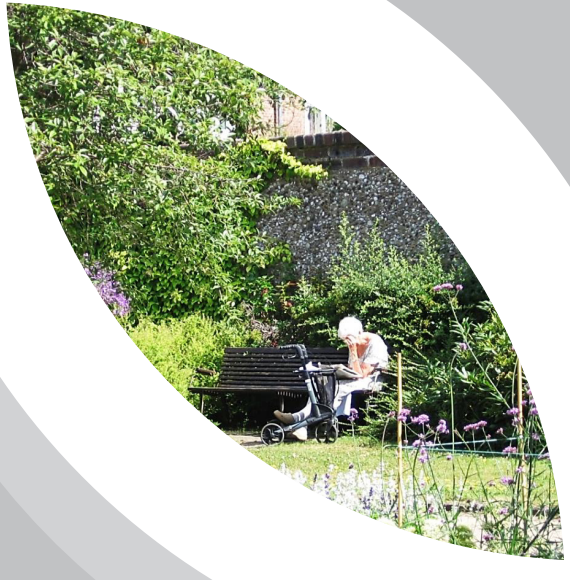

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Abstract

This PhD thesis is based on research which was conducted between 2009 and 2012. It deals with green outdoor environments (GOEs) at acute care hospitals in the capital region of Denmark. The aim of the PhD study is to gain deeper knowledge about the design and use of GOEs which supports mental restoration. For this purpose, five cases were selected. Site analyse, questionnaire surveys and personal interviews with the staff were used to achieve the aim of the study. A literature review was conducted to clarify the state-of-the-art regarding design recommendations for GOEs at healthcare facilities.

The findings from the literature review revealed that there are two types of publications (peer-reviewed papers and best practice guidelines) that have offered recommendations for the design of GOEs at healthcare facilities. After the review process, seven main themes were derived which contained 22 design guidelines which formed a survey tool called the Common Design Recommendations (CDRs).

The CDRs were later used to analyze the design characteristics of the five hospitals' GOEs. The Perceived Restorativeness Scale (PRS), which was included in the questionnaire, was used with the intention of identifying which hospital GOE was perceived by the users as being the most restorative. The findings show that the GOE at Bispebjerg Hospital, the design characteristics of which conform to three themes in the CDR, is perceived as having the most restorative potential even when compared to Rigshospital and Hvidovre which conform to more CDRs. The location, surroundings and the facilities were shown to contribute to the success and users' satisfaction of the GOE.

The findings also show that GOEs are used more by staff, compared to patients and visitors. The most frequent activities performed in the GOEs are smoking, having lunch, and relaxing. In general, employees spent the least time in the GOEs (between 5 to 10 minutes) due to their work schedule compared to patients who spent between 10 to 20 minutes. The inclusion of water features was considered as the most popular landscape element. The preference for sun and fresh air indicates that many hospital users would like to spend time outside the buildings. The majority of users are satisfied with the existing GOEs and the results gained from the PRS indicate that they regard the GOEs as having potential for mental restoration. Personal interviews with 15 employees from all five hospitals indicated what employees experience in the GOEs and what improvements they would like to see. Among the recommendations from the employees was easy access, a window view of the GOE and private spaces for staff.

The important contributions of this PhD study are that it highlights the significance of having GOE at acute care hospitals and the proposal of a design survey tool (the CDR). The tool can be used as a quick guide for professionals dealing with the design and management of healthcare facilities when evaluating either existing or future GOEs. Based on the results of the CDR and the study of the five cases, thirteen recommendations were proposed. Maintenance aspects have been identified as the weakness concerning the CDR which gives areas for the survey tool to be improved in the future. The findings of this study indicate that GOEs have potential as restorative settings and should therefore be considered as valuable assets at healthcare facilities.

Resumé (Danish abstract)

Denne ph.d.-afhandling er baseret på forskning, som blev gennemført mellem 2009 og 2012. Den fokuserer på *grønne udearealer* (GOE) ved hospitaler i hovedstadsområdet i Danmark. Formålet med afhandlingen er at undersøge udearealernes design og medarbejdere, patienter og besøgendes brug af disse arealer herunder deres ønsker om bestemte karakteristika og deres generelle tilfredshed med GOE'erne. Brugernes opfattelse af GOE'erne som restituerende element er også en del af undersøgelsen.

Til dette formål blev fem case studies udvalgt. En analyse af stederne, et spørgeskema og personlige interviews med personalet blev anvendt som metoder. En gennemgang af litteraturen blev udført for at afklare state-of-the-art med hensyn til designanbefalinger for GOE'er ved hospitaler.

Litteraturstudiet identificerede syv hovedtemaer, som indeholdt 22 design guidelines, der til sammen dannede et undersøgelsesværktøj: *Common Design Recommendations* (CDR). CDR'erne blev senere brugt til at analysere de designmæssige karakteristika i de fem GOE'er. I spørgeskemaet var inkluderet en *Perceived Restorativeness Scale* (PRS), som blev brugt til at identificere, hvilken af GOE'erne brugerne opfattede som de mest restituerende. Resultaterne viser, at GOE'en på Bispebjerg Hospital, hvis design er i overensstemmelse med tre temaer i CDR'erne, har det største potentiale, sammenlignet med de andre, som faktisk er i overensstemmelse med flere CDR'er. Beliggenheden, omgivelserne og faciliteterne bidrager til brugernes tilfredshed med Bispebjergs GOE.

Resultaterne viser også, at GOE'erne bruges mere af personalet end af patienter og besøgende. De mest populære aktiviteter er rygning, spisning af frokost og afslapning. Personalet brugte dog kortest tid i GOE'erne (5-10 minutter) på grund af deres arbejdsopgaver. Til sammenligning brugte patienterne 10-20 minutter udendørs.

Personlige interviews med 15 medarbejdere fra alle fem hospitaler viste, hvad medarbejderne oplever i GOE'erne, og hvilke forbedringer de gerne vil have. Blandt anbefalingerne fra medarbejderne var let adgang til GOE'erne, vinduer med udsigt til de grønne områder og private arealer for personalet.

Vand var det meste populære element. Ønsker om sol og frisk luft viser, at mange af sygehusets brugere gerne vil tilbringe tid uden for bygningerne. De fleste brugere er tilfredse med de nuværende GOE'er, og resultaterne fra PRS viser, at de betragter GOE'erne som restituerende.

Afhandlingens vigtigste bidrag er, at den foreslår et design-undersøgelsesværktøj (CDR'er), som kan bruges som en hurtig guide for fagfolk, der beskæftiger sig med design og forvaltning af udearealer ved hospitaler, både i forhold til eksisterende og fremtidige GOE'er. På grundlag af afhandlingen opstilles tretten anbefalinger.

Driften af arealerne er identificeret som en svaghed i design-anbefalingerne, og det tyder på, at der er behov for at forbedre undersøgelsesværktøjet (CDR) fremover. Resultaterne af denne undersøgelse viser, at GOE'er har potentiale som restituerende element og derfor bør betragtes som værdifulde aktiver ved hospitaler.

Abstrak (Malay abstract)

Thesis PhD ini adalah berdasarkan penyelidikan yang telah dijalankan di antara tahun 2009 sehingga 2012. Ia bertumpu kepada persekitaran luaran hijau (GOE) di hospital akut di wilayah utama Denmark. Tujuan utama penyelidikan PhD ini adalah untuk menyiasat reka bentuk dan penggunaan GOE berciri restoratif. Bagi tujuan ini, lima kes kajian telah dipilih. Analisis tapak, borang soal selidik dan temu bual perseorangan di kalangan kakitangan telah digunakan untuk mencapai tujuan kajian ini. Kajian literatur telah dijalankan untuk mengetahui tahap pengetahuan sedia ada mengenai cadangan reka bentuk GOE di institusi kesihatan.

Penemuan daripada kajian literatur menunjukkan bahawa terdapat dua jenis penerbitan (‘*peer-review’* dan *‘best practice guidelines’*) yang ada memberi cadangan untuk reka bentuk GOE yang terdapat di institusi kesihatan. Selepas proses analisis, tujuh tema utama telah diperolehi yang mengandungi 22 garis panduan yang membentuk alat menilai rekabentuk yang dipanggil sebagai ‘*Common Design Recommendations’ (CDR).*

CDR kemudiannya digunakan untuk menganalisis lima GOE di hospital. *The Perceived Restorativeness Scale* (PRS) telah disertakan di dalam borang soal selidik untuk mengenal pasti GOE yang dianggap oleh pengguna sebagai yang paling bercirikan restoratif. Hasil penemuan menunjukkan bahawa GOE di Hospital Bispebjerg yang mempamerkan ciri-ciri reka bentuk di dalam tiga tema di CDR dilihat sebagai mempunyai potensi restoratif paling tinggi walaupun dibanding dengan Rigshospital dan Hospital Hvidovre yang mempamerkan lebih banyak ciri rekabentuk di dalam alat CDR. Lokasi, persekitaran dan kemudahan yang ada dikenal pasti sebagai penyumbang kepada kejayaan dan kepuasan di kalangan pengguna GOE.

Hasil kajian juga menunjukkan bahawa penggunaan GOE di kalangan kakitangan adalah lebih tinggi berbanding dengan pesakit dan pelawat. Antara aktiviti yang dijalankan di GOE termasuk merokok, makan tengah hari, dan untuk berehat. Secara umumnya, kakitangan hospital menghabiskan masa pendek (antara 5 hingga 10 minit) disebabkan oleh jadual kerja mereka berbanding dengan pesakit yang berada di GOE antara 10 hingga 20 minit. Temu bual perseorangan dengan 15 pekerja dari semua lima hospital telah memberi petunjuk tentang pengalaman mereka di dalam penggunaan GOE dan juga penambahbaikan yang mereka mahu untuk GOE. Antara cadangan yang diutarakan oleh kakitangan adalah kemudahsampaian, pandangan dari tingkap ke arah GOE serta ruang khas untuk pekerja di GOE. Ciri air adalah yang paling digemari di GOE. Keinginan untuk mendapatkan udara segar serta pancaran matahari menunjukkan bahawa para pekerja dan pesakit mempunyai keinginan tinggi untuk keluar dari bangunan hospital. Majoriti pengguna berpuas hati dengan GOE yang sedia ada dan hasil dari PRS juga menunjukkan bahawa mereka menganggap GOE mempunyai potensi untuk restoratif minda.

Aspek yang dianggap penting di dalam hasil kajian PhD ini adalah ia menekankan kepentingan GOE di hospital akut serta cadangan alat kajian (CDR) yang mudah dan boleh menjadi panduan untuk mereka yang terlibat dengan reka bentuk serta pengurusan GOE. Alat panduan ini dapat diguna di dalam menilai GOE sedia ada serta dan juga yang akan dibina. Berdasar dari keputusan CDR serta lima kajian kes, sebanyak tiga belas saranan reka bentuk dicadangkan. Aspek penyelenggaraan telah dikenalpasti sebagai kelemahan CDR yang boleh diperbaiki di dalam kajian masa hadapan. Hasil dari kajian ini menunjukkan GOE mempunyai potensi sebagai persekitaran berciri restoratif dan boleh dianggap sebagai aset yang berharga untuk institusi kesihatan.

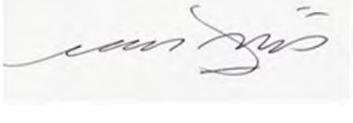
Preface

I was introduced to restorative green outdoor environments back in 1994 when I was searching for a topic for my final project during my bachelor program at Universiti Teknologi Malaysia. As I was the first in my country to embark on this topic back then, I faced difficulties finding information relating to this area. Local sources were scarce and those that I found were mostly from the United States. The next step was to find an actual site to be designed for the purpose of the final project. I was granted permission to use some areas at one of the university hospitals in Kuala Lumpur as part of the project. I soon discovered that available areas were limited at the hospital and so I had to work with so called 'left-over' spaces. I had the opportunity to present my ideas to the management of the hospital. At the end of the presentation, I was told that the hospital would rather spend the amount of money needed to construct the garden on medical equipment or other facilities instead. This incident brought home to me how understanding and appreciation of the benefits of green outdoor environments was still in its infancy in my country. Much work is needed to change this perception. It has been two decades since my student days and much research concerning the benefits of green outdoor environments (GOEs) at hospitals has been carried out in many countries including Malaysia**.** In 2004, I took a Master's degree with the aim of studying garden design for a specific patient group, which was children suffering from Down's syndrome. This study exposed me to the numerous design recommendations for different types of outdoor environments at healthcare facilities, especially relating to therapeutic/healing /restorative environments. I decided that I would continue in this area of study once I was accepted to do my PhD in Copenhagen. Doing my PhD at the University of Copenhagen has given me new knowledge in the field of hospital's GOE design. Being in Denmark has also exposed me to a different culture and weather and I was very much interested to learn how the hospitals' green outdoor environments were designed in relation to these aspects. My experiences here have taught me a lesson in humility as a designer when dealing with the design of green outdoor environments. Designers can produce attractive designs for GOEs according to the theory of landscape architecture. However, the design will not be considered successful if it is not used as intended and if the needs of the users are ignored.

Many have helped in the completion of this PhD study. I would like to express my gratitude to my main supervisor, Kjell Nilsson who, with his wisdom and wise comments has always managed to steer me in the right direction for this PhD study. My appreciation also goes to my co- supervisor, Ulrika Karlsson Stigsdotter, whose excellent knowledge in the field of health and green outdoor environments has been a tremendous help to me when writing my papers. My family has also contributed enormously in terms of emotional support, especially my father, Abdul Shukor, and my mother, Wan Chik Saad. My siblings, in particular Shuzeleene Faris, have helped from a far in so many ways during my stay abroad. Thank you to my colleagues at Forest & Landscape, especially to Anne, Victoria, Akmar, Maja, Lene, Inger and Karin. You girls are my pillar of strength during difficult times. My thanks also to my colleague at Universiti Putra Malaysia, Dr Murad Ghani who was always ready to assist whenever I needed him. I would also like to thank the staff at ArchiMed, especially Pernille Weiss Terkildsen for having such great confidence in me.

Last but not least, to my children, Adam Faris and Addin Faris. You are both the light of my life. I love you both and this thesis is for you.

Thank you, Tusind tak and Terima kasih.



Shureen Faris Abdul Shukor
Copenhagen, December, 2012

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1.0 INTRODUCTION

This PhD study analyses the design and use of green outdoor environments (GOEs) at acute care hospitals in Denmark and their potential for mental restoration. Photographs from the Danish Medical Museum's archive show that the outdoor environments were used as part of patients' treatment as far back as the early1900s. The development of Danish hospital planning and design through the three major paradigms from the aesthetic hospital to the pavilion hospital and lastly, the technological hospital (see Heslet and Dirckinck-Holmfeld, 2007) has led to many changes in the use of outdoor environments. Furthermore, much evidence has been found regarding the potential of GOEs to provide mental and physical support and to make a positive contribution to the users' health and well-being Therefore, a study on the design of the green outdoor environments (GOEs) at acute care hospitals in Denmark is essential.

Photo 1 *A view at one of the hospitals in Denmark circa 1930 showing how patients were taken outside the ward during the summer for fresh air and sun (Source: Rigshospital, photo from the Danish Medical Museum)*

1.1 Aim and research questions

Based on existing studies of GOEs, it can be hypothesized that GOEs at acute care hospitals contribute to a less stressful environment by offering mental restoration. The aim of this study is to gain deeper knowledge about the design and use of GOEs (with regards to the local culture and weather) which support mental restoration by analysing GOEs at acute care hospitals in Denmark. To address this aim, the following research questions were formulated:

1- What is the state-of-the-art in terms of research and good practice regarding design recommendations for GOEs at healthcare facilities? (Paper I)
2- What are the users' characteristics, how do they use GOEs and what are their preferences regarding GOEs? (Papers II and III)
3- Do users perceive the GOEs as restorative? (Papers II, III & IV)
4- What are the design characteristics of the GOEs and which are perceived as being the most restorative? (Paper IV)

The thesis consists of four research articles (Papers I, III, III and IV) and is organized and focused according to the research questions. Paper I covers the state-of-the-art regarding design recommendations for GOEs at healthcare facilities. Paper II focuses on how hospital employees use the GOEs and their preferences, while Paper III is similar to Paper II, but focuses on the patients. Paper IV applies the results from Paper I, i.e. the Common Design Recommendations (CDR) tool, together with the Perceived Restorativeness Scale (PRS) to identify and discuss the characteristics of GOEs which are perceived as being the most restorative.

In this thesis, the introductory part (chapter 1) presents the aim of the study and the research questions. This is followed by the background section in chapter 2 which briefly covers the history and the role of GOEs at healthcare facilities. Related theories and research concerning restorative environments are also presented in the background chapter. The description of the research design and the methods used are explained in chapter three. In chapter four, the results are presented with reference to the research questions which are followed by the discussion section in chapter five. Finally, in chapter six, the conclusions are drawn and recommendations for future research are proposed.

1.2 Definitions of terms

A few terms are frequently used throughout this thesis and it is important to be familiar with the definitions in the context of this study.

***Acute care hospital* is defined as a** local or regional institution which has emergency facilities, wards to recover from sickness and also provides care for walk-in patients (Cooper Marcus and Barnes, 1999). In Denmark, acute care hospitals are also known as district hospitals which are centrally located hospitals which gather the specialties for each planning district (Denmark Hospital Plan 2007).

***Green outdoor environment* (GOE) is defined as** the exterior of hospitals such as gardens, courtyards, and roof top gardens found at acute care hospitals. They are designed with soft and hard landscape features that can be used and enjoyed by everyone at the hospitals. Only areas that can be accessed by all users (e.g. staff, patients and visitors) are included.

Design characteristics are defined as the appearance and landscape features in the green outdoor environments consisting of the location and view; accessibility; layout and space; seating arrangements; planting; design details; and practical services.

Design recommendations are defined as suggestions or proposals for the design of GOE and "performance guidelines, the intention of which is not to tell the designer what to do, but rather to provide reminders of recommended qualities and elements" (Cooper Marcus and Barnes, 1999, p. 24).

Evidence-based design (EDB) is defined as an approach to environmental design that aspires to base design decisions on documented research and well-established best practices, with the aim of improving outcomes (Goetz, et al., 2010; Hamilton, 2003; Ulrich et al., 2004).

Restoration is defined as a process of recovery from stress that involves numerous positive changes in psychological state, in levels of activity in physiological systems and, often in behaviors or functioning (Ulrich et al., 1991).

Restorative environments are defined as the environments beyond the hospital buildings (Gerlach-Spriggs et al., 1998) that provide opportunities to reduce direct attention fatigue (Kaplan, 1995). In some literature, healing, therapeutic and supportive environments are used as synonyms to restorative environments.

Healing gardens are defined as environments that are designed with intention to have effects on the users' health, without any therapeutic activities (Haller, 2004) and dominated by plants and other

aspects of nature which are generally associated with hospitals and other healthcare settings (www.ahta.org).

Therapeutic gardens are defined as places designed with therapeutic intervention in order to improve health through the interplay between the therapeutic setting, the therapeutic activities, the therapeutic team and the clients (Cooper Marcus and Barnes, 1999; Stigsdotter and Grahn, 2002, 2003).

2.0 BACKGROUND

2.1 Historical background of GOEs at healthcare facilities

There are a number of publications which trace the influence of the outdoor environment on people's health, from ancient times to the present day (e.g. Thompson, 2010). Restorative GOEs for the sick have been part of healing since medieval times (Gerlach-Spriggs, Kaufman and Warner, 1998). European monastic or cloistered gardens were most likely the first type of restorative GOEs in which monks grew medicinal plants (Davis, 2002). The monastic cloister became a common design for monasteries with buildings enclosed behind walls, surrounding a central courtyard. This courtyard was most often designed to symbolize the Garden of Eden referred to in Genesis of the Bible (Davis, 2002). In some cases, because of their healing qualities, these GOEs were also used as places where sick patients could spend time (ibid). During the 14th and 15th centuries, the monasteries depleted the medical resources they were at one time able to provide (Davis, 2002). Thus with the decline of monasticism itself, the significance of the meditative/restorative GOE also declined, and open spaces attached to hospitals were not prioritized in the local architectural tradition (Cooper Marcus and Barnes, 1999). It was not until the 17th and 18th centuries that the inclusion of GOEs in medical settings became important once more when the dual emergence of scientific medicine and Romanticism fortuitously combined to encourage the re-emergence of usable outdoor spaces at hospitals (Cooper Marcus and Barnes, 1999).

Photo 2 *The covered corridors outside the wards provided protection from wind and rain and were used by patients as part of the treatment circa early 1900s (Source: Rigshospital, photo from the Danish Medical Museum).*

However, the design revolution during the first decade of the twentieth century, with specialization according to the patients' condition, e.g., acute surgical, chronic medical, etc. resulted in increased demand for hospitals, especially in crowded American city centres (Gerlach-Spriggs, Kaufman and

Warner, 1998). Gardens disappeared, balconies and roofs and solaria were abandoned, and landscaping was restricted to entrance beautification, tennis courts for the staff, and parking lots for employees and visitors (ibid). Dissatisfaction with sterile, intimidating, high-tech environments later prompted the creation of 'healing gardens' at many hospitals and clinics (Cooper Marcus and Barnes, 1999; Hartig et al, 2010). In addition, the recent interest in complementary and alternative therapies, which emphasize healing the mind, body and spirit, rather than simply alleviating symptoms has also revived interest in GOEs to support restoration (Gerlach-Springs, Kaufman and Warner, 1998).

Discussions within the medical and nursing disciplines about how to achieve restorative environments at hospitals mostly focused on indoors (see e.g Dijkstra et al., 2006; Ulrich, 1991, Ulrich et al., 2004, 2008; Venolia, 1994). Studies were mostly inspired by the work of Florence Nightingale in 1859 who suggested that patients would recover from illness more quickly if they were cared for in an environment that was clean and had natural light, ventilation and basic sanitation (Goldin, 1994). In accordance with this, the use of natural light, appropriate colours, therapeutic sound, and the provision of private areas and views of nature was proposed in the building interior , (see e.g. Altimier, 2004; Biley, 1996; Dijkstra et al., 2006; Ulrich et al., 2008, 2004). Ananth (2008) coins the term 'optimal healing environment' (OHE) which represents a wholesome approach to the healing process and encompasses both the inner and outer environments. Today, designers and especially landscape architects attempt to design outdoor hospital environments so that they take into consideration the fact that one heals more quickly in a supportive atmosphere, one that ameliorates stress and provides opportunities for positive escape from clinical settings (Ulrich et al., 2004).

2.2 Research relating to evidence-based design and the benefits of green outdoor environments

There is a substantial research evidence which indicates that having a view of or being in nature or green outdoor environments has a positive influence on the physical and mental wellbeing of users, especially patients in that it can have a relaxing influence and reduce stress levels (e.g., Hendrich et al., 2008; Mroczek et al., 2005; Nilsson et al., 2011; Pati et al., 2008; Sherman et al., 2005; Ulrich, 1984; Ulrich et al., 2004, 2008; Vischer, 2008; Whitehouse et al., 2001). A large body of research is also consistent with the proposition that humans are hard-wired to appreciate and benefit from exposure to nature (Malkin, 2008). Recent studies on these salutogenic (health creating) effects of the green environment have shown that nature can reduce stress levels, restore powers of concentration, and alleviate irritability, while correlations with strengthening of muscles and preventing aches and pain all over the body have also been noted (Nilsson et al., 2011).

In the report entitled, 'The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity' by Ulrich et al. (2004), it is shown that nature effectively reduces stress (along with music, animals, comedy, and art). Hospital GOEs not only provide restorative or calming views of nature, they can also reduce stress and improve health outcomes through other mechanisms such as providing access to social support and opportunities for positive escape and sense of control with respect to stressful clinical settings (Cooper Marcus and Barnes, 1995; Ulrich, 1999, 2004). The benefits of preferred natural landscapes as places for reflection and healing include the reduction of stress, the improvement of mood, and the provision of recreational activities (Cooper Marcus and Barnes, 1999). Experiencing visually pleasant physical surroundings reduces stress by eliciting positive emotions, sustaining non-vigilant attention, restricting negative thoughts, and returning physiological arousal to moderate levels (Parsons and Hartig, 2000).

Professionals and researchers dealing with the design of healthcare facilities are now using an indicator or measure of a patient's condition or progress in an approach called Evidence-based Design or EBD (Smith, 2007). This approach is based on information available from both research and project evaluations. Such design approaches are engaged to create environments that are supportive of family involvement, efficient for staff performance, and restorative for workers under stress (Hamilton, 2003). The concept of EBD first gained formal recognition in 2003 (Viets, 2009). Evidence-based design is defined as "a process for the conscientious, 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 and Watkins, 2009, p. 9). Evidence-based design (EBD) is a field of study which borrows terminology and ideas from several disciplines including environmental psychology, architecture, neuroscience and behavioral economics (Frandsen et al., 2009). Furthermore, the fields of medicine, public health, nursing, social work, crime prevention, and education are a few of the many disciplines that employ an evidence-based approach to problem solving (Viets, 2009). EBD is derived from the concept of evidence-based medicine (EBM) which was formally recognized in 1992 (Evidence-Based Medicine Working Group, 1992). In the beginning, EBM focused specifically on the role of physicians as evidence-based practitioners. However, with the recognition that evidence-based practices are not limited to physicians, the concept was expanded to include evidence-based contributions from a variety of related disciplines such as nursing, psychiatry, and public health (Viets, 2009). To draw a comparison with architecture, Viets (2009) mentions that EBD concepts can be applied not only by architects, but also by the entire project team. Interior designers, engineers, and landscape architects are just a few of those who often contribute to an evidence-based approach to a project (ibid). Researchers involved with the design of green outdoor environments, especially at healthcare facilities, could produce results for practitioners to apply (Brown and Corry, 2011).

A descriptive systematic review of the available literature and evidence on health and wellbeing and the natural environment by Davies (2007) based on 67 papers which included several themes on the promotion of patients' health. One of these themes is the restorative effects of nature and the report contains evidence that supports the fact that having a view of nature helps patients in hospitals to heal more rapidly (Davies, 2007). A study by Ulrich (1984) shows that interaction with nature improves our quality of life by lowering stress levels, reducing muscle tension, and blood pressure, and by increasing our tolerance to pain. Ulrich (1984) also reported that patients who had a view of trees, had shorter hospital stays, took less pain killers, had fewer complications with surgery, and had fewer negative comments on their nurse reports compared to patients who had a view of a brick wall. Measurements of the perceived pain suffered by subjects who, while they suffered pain, watched a video of a natural environment, indicated that they exhibited a significantly higher pain threshold and significantly longer pain endurance compared to the control group (Tse et al., 2002). Results from a similar study in a hospital context support this result in that patients who saw pictures and heard sounds from nature during treatment, experienced less pain during treatment than the control group (Diette et al, 2003).

Viewing or being in a natural surrounding has also been shown to have an influence on staff and visitors. Based on post-occupancy evaluations of four hospital gardens in California, Cooper Marcus and Barnes (1999) concluded that many nurses and other healthcare workers used the gardens as a pleasant escape and to recover from stress. Other post-occupancy studies indicate that patients and their families who use hospital gardens report positive mood changes and reduced stress (Whitehouse et al., 2001). The evaluation of a healing garden in a United States children's hospital confirms previous findings concerning the positive impact that experiencing green surroundings can have on people. However, the study also emphasizes that having a GOE is not sufficient as its location and design are essential factors in determining whether it gets used or not (Whitehouse et al., 2001).

2.3 Theoretical framework

Many different theories are used, and together they build up the theoretical framework that we today rely upon. The Prospect-Refuge Theory (Appleton, 1975) claims that positive feelings are gained from adaptive functions of preferences regarding certain landscape characteristics. This theory stipulates that individuals attain unimpeded opportunity to see the landscape, a prospect and perceives opportunity to hide or refuge. A courtyard garden in a western monastery, for example, is a refuge because it protects the sick from adverse climatic conditions (Cooper Marcus and Barnes, 1999).

The studies which deal with the restorative, health-related effects and the human benefits derived from contact with nature consistently refer to the Biophilia hyphothesis (Wilson, 1984) which suggests that humans tend to respond positively to nature. Ulrich (1993) discusses this further by suggesting that there are three general types of biophilic response to unthreatening natural settings. The responses are: liking/approach responses; restoration or stress recovery responses; and enhanced high-order cognitive functioning when a person is engaged in a non-urgent task. The Psycho-Evolutionary Theory (Ulrich et al., 1991) claims that emotional responses are instant and unconsciously triggered and have a major influence on attention and behavior (ibid). In unthreatening natural settings, such as an outdoor environment away from wards, restorative responses can be achieved and the capacity for restorative responses to unthreatening natural settings has made it possible to avoid stress and restore energy (ibid).

Attention Restoration Theory (ART) is the central theory used in this study. ART (Kaplan, 1995) characterizes psychological components that support a restorative environment which may help people to recover from depleted directed attention capacity. The theory describes two different types of attention, which are based on different brain functions (Kaplan and Kaplan, 1989). 'Directed attention,' is used to perform demanding tasks or to deal with disturbing environmental stimuli. Individuals have limited capacity for directed attention, and if it is used without opportunities to restore, it can lead to mental fatigue. Natural environments provide opportunities for more effortless attention, called 'soft fascination', which facilitates mental restoration (ibid.). Restoration of the capacity to direct attention helps people to manage their anxieties and reduce stress. Enhanced ability to focus both helps people to work through their concerns and helps them put aside their anxieties in order to function normally. Experiencing or simply viewing nature may allow patients to momentarily escape mentally from the ward and illness. According to ART, restoration from attention fatigue can occur when a person gains psychological distance from tasks, the pursuit of goals and the like, for which she or he must direct attention (being away). Extent is one of the components that support being away, where a setting is sufficiently rich and coherent that it can engage the mind and promote exploration (Kaplan and Kaplan, 1989). Applying this quality to the hospital GOE means it has to have diverse vegetation and structures and facilities that encourage users to use the GOE. Furthermore, restoration is promoted if the person can rely on effortless, interest-driven attention (fascination) when experiencing the environment. In hospital settings, this may mean that patients could gain fascination from viewing the GOE from the ward as well as by participating in outdoor activities. Compatibility refers to the match between an individual's goals, the demands made on the individual by environmental conditions, and the patterns of information available in the environment which support purposive and required activities (Kaplan, 1983).

Besides ART, Ulrich's practice-oriented Theory of Supportive Gardens (1999) deals with the effects on health outcomes of GOEs at healthcare settings. The conceptual model explains that the four qualities provided by GOEs at healthcare facilities foster certain restorative and coping resources which could lead to stress restoration and later improved health outcomes. 'Sense of control' refers to the need for temporary escape and access to privacy, while 'social support' refers to the capacity of a GOE to increase social and emotional support among patients, visitors and staff through the activities. The next quality, 'physical movement and exercise' suggests that mild exercise and physical rehabilitation improves psychological well-being, especially among patients. Finally, 'natural distractions' refers to environmental design elements that promote restoration from stress in patients, visitors and hospital employees (Ulrich, 1999, 1992). Therefore, hospital GOE should convey a sense of security, ensure that people have control of their activities, give support to the patients and contain elements that promote play and exercise to improve psychological well-being and foster gains in health outcomes. In summary, Attention Restorative Theory and the Theory of Supportive Gardens focus on human encounters with the natural environment that mitigate stress thereby resulting in positive emotional responses such as fascination and reflection. The restorative outcomes include positive feelings and satisfaction (Kaplan and Kaplan, 1989) and also an improved capacity to cope with stress and shift towards a more positive emotional state (Ulrich, 1999).

2.4 Research gaps

There is a lack of research supporting evidence-based design concerning GOEs at healthcare facilities, especially in a Danish context (Frandsen et al., 2009). There is also little knowledge regarding the demographics of GOE users, the activities performed while visiting GOEs and how much time is spent there. There is also a lack of information regarding hospital employees' use of GOEs. Research concerning design recommendations for healthcare GOEs has been conducted in many countries (see, e.g. Barnhart et al., 1998-Canada; Bengtsson and Carlsson, 2006-Sweden; Hosking and Haggard, 1999-United Kingdom; Kearney and Winterbottom, 2005-United States; Said et al., 2002-Malaysia; Sherman et al., 2005-United States). Furthermore, design recommendations for GOEs at acute care hospitals have also been formulated (see Asano, 2008; Cooper Marcus and Barnes 1999; Davis, 2011; Johnson, 2002; Shackell and Walter 2012; Ulrich, 2002).

According to the Danish report 'Capital Region Hospital Plan' (2007), a study on the outdoor spaces at hospitals in Denmark is needed as a growing awareness has developed in recent years in the healthcare community of the need to create functionally efficient environments that also have pleasant, stress-reducing characteristics. Statistics Denmark (2012) reported that the social expenditure in 2010 amounted to DKK 569 billion and of this amount, DKK 128 billion was spent on relation to health. One out of nine Danes is reportedly hospitalized one or more times a year (Statistics Denmark, 2012). An increase in population and a reduction in the number of hospitals in Denmark may mean that the existing hospitals may not be able to accommodate the growing population. Due to this situation, stress among staff and patients is expected to increase. Therefore it is important to investigate ways to reduce stress at hospitals and the duration of hospital stays.

3.0 METHODS

In order to achieve the aim of this PhD study, answer the research questions and, fill the knowledge gap, this study applies a triangular approach and a number of different methods. The main rationale for the use of a variety of methods means that the results of an investigation which employed a particular method associated with one research strategy can be cross-checked with the results of a method associated with another research strategy (Bryman, 2008). The use of personal interviews with hospital employees was not discussed in any of the papers and hence it is elaborated on in the results and discussion sections of this introduction. The systematic review, the questionnaire survey and the case study approach are thoroughly described in the individual papers.

3.1 Research design

The study is organized and focused in such a manner that all the research questions could be investigated. Paper I is based on a systematic literature review, while papers II and III focus on the data from the questionnaire survey and paper IV is a combination of the results from paper I (the CDR tool) and a section from the questionnaire survey (the Perceived Restorativeness Scale). The research design framework which illustrates the relationship between the four papers is presented below (Figure 1).

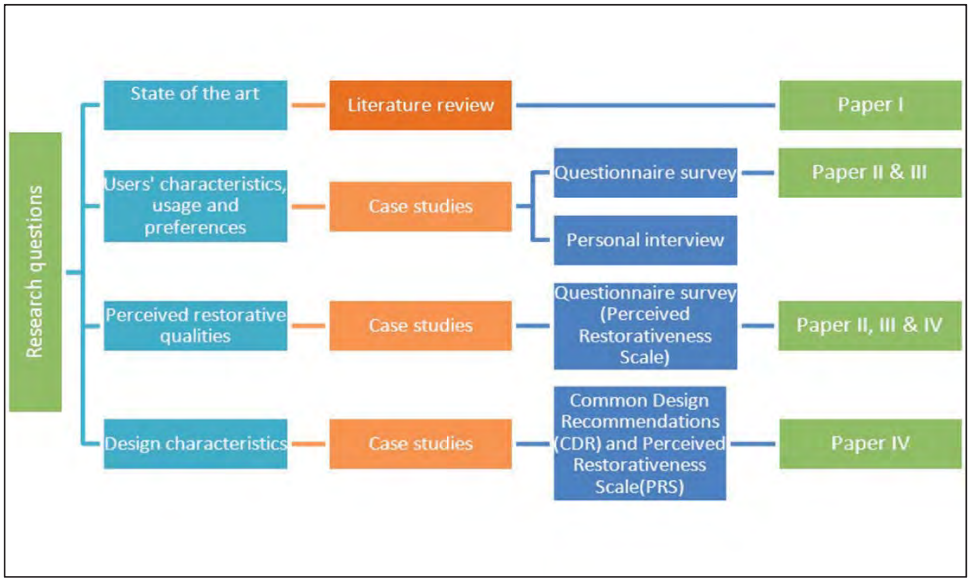

Figure 1 *The research design framework*

3.1.1 Systematic review (Paper I)

The aim of the review is to examine the existing evidence for design recommendations for health supportive outdoor areas at healthcare facilities. A systematic approach was adopted to identify and collect the relevant literature which included the formulation of criteria for the inclusion of literature. The selected literature had to focus on the design aspects of therapeutic, healing, restorative and supportive gardens, landscapes or environments, and had to specifically present and discuss design recommendations. Furthermore, two types of literature were included in the study; peer-reviewed papers and best practice guidelines and, only literature from English language sources was included in the search. The literature used also had to be published before July 2012 (when the search was conducted). An online, computer-based search of the databases within the fields of medicine, psychology, architecture, and landscape architecture was conducted. The search also included manual reference-checking ('snowballing') to identify additional sources. The analytical framework for the review is primarily based on the Therapeutic Garden Audit for Acute Care Hospital by Cooper Marcus and Barnes (2010) and design guidelines from Tyson (1998). The 21 reviewed publications were then listed under the relevant type of healthcare facility (children's hospital, psychiatric hospital, hospice, acute care hospital, or nursing home). Each publication that mentioned some of the design recommendations was marked with an 'X' and the total number of times the design recommendation category was mentioned in the reviewed literature was then calculated and totalled. The analysis of the publications is thoroughly described in Paper I.

3.1.2 Case studies selection (Paper III, III and IV)

No previous studies have been carried out to analyse GOE designs at acute care hospitals in Denmark. Therefore, a selection process was conducted with the aim of best representing the different GOEs. Due time limitations, the focus was restricted to the capital region (*Region Hovedstaden*) of Denmark as it currently provides services to an estimated population of 1.6 million, which is 30% of the country's total population (Statistics Denmark, 2009). There are ten acute care hospitals in the capital

region of Copenhagen located in four districts, the North, the Centre, the City and the South (Figure 2). To ensure that the four districts were proportionally represented, i.e. one hospital in each, and to obtain as much varied information as possible, the study focused on cases that were based on a few selection criteria. There are two types of hospital in Denmark: somatic (psychiatric) and acute care hospitals. In order to answer one of the study's research questions; to identify the users of the GOEs, the latter was selected as the GOEs at acute care hospitals are considered to be accessible to all. The GOE design type was also taken into consideration such as ground level and roof top; open and enclosed areas; modern contemporary and old pavilions, among others. The architectural time period of the hospitals was also taken into consideration, along with the size and location of the GOEs. Based on these foci, the following four hospital case studies were selected: Bispebjerg, Herlev, Hillerød and Hvidovre. Furthermore, Rigshospital was also included in the study, as, while it is not associated with any planning district, it is the national hospital and is located within the study area (Figure 3).

Figure 2 *The map showing the locations of the five hospitals in the planning districts (Source: Summary of Hospital for the Capital Region- Hospital Plan 2007, p. 4)*

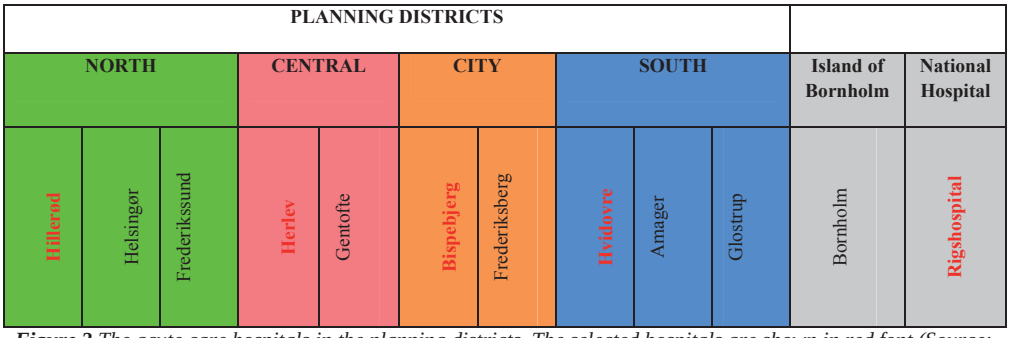

Figure 3 *The acute care hospitals in the planning districts. The selected hospitals are shown in red font (Source: Summary of Hospital for the Capital Region- Hospital Plan 2007, p. 5)*

Bispebjerg Hospital

Bispebjerg Hospital is a community hospital for the inhabitants of the city planning district of Copenhagen. The hospital was completed in 1913. There are currently 3,095 employees at the hospital who serve a population of 400,000. The selected GOE for this study is located at one of the main entrances and is surrounded by the Geriatric, Palliation and Laboratory buildings. The selected GOE is approximately 2,400m^2 and was chosen as the area is accessible to all. The GOE is situated on an uphill gradient and has a grand staircase at its centre. The GOE is designed along the lines of a romantic, English garden and features plant borders with diverse colourful annuals, perennials and roses. The borders are well-maintained and gardeners were routinely seen working in the GOE. There are two water features, a pond and a fountain which is in good working condition. Benches, sculptures and waste bins are also provided. The GOE is also used by non-hospital users such as children from a nearby nursery who sometimes come to see the fountain and the pond and also groups of elderly people who use the grand staircase for walking exercise once a week.

Herlev Hospital

Herlev Hospital is a community hospital for the residents of the central planning district of Copenhagen. The hospital building, which is the tallest building in Denmark, was completed in 1976 and there are currently 4,173 employees who serve an estimated population of 425,000. There are two GOEs located in front of the hospital. The GOE which is adjacent to a café and faces an open field was selected for this study as it was observed to be frequently used. The selected GOE is approximately 3,000m^2. The layout of the GOE provides visual interest when viewed from the high hospital tower. The majority of the GOE's surfaces are grass and there is a 2 meter high hedge which creates enclosed spaces. The high hedges block strong winds, but there is also a drawback as they hide the existence of the GOE from potential users who are unfamiliar with the hospital area. The facilities provided here include benches and waste bins. Unlike the other hospitals, birds were seen in abundance in the GOE.

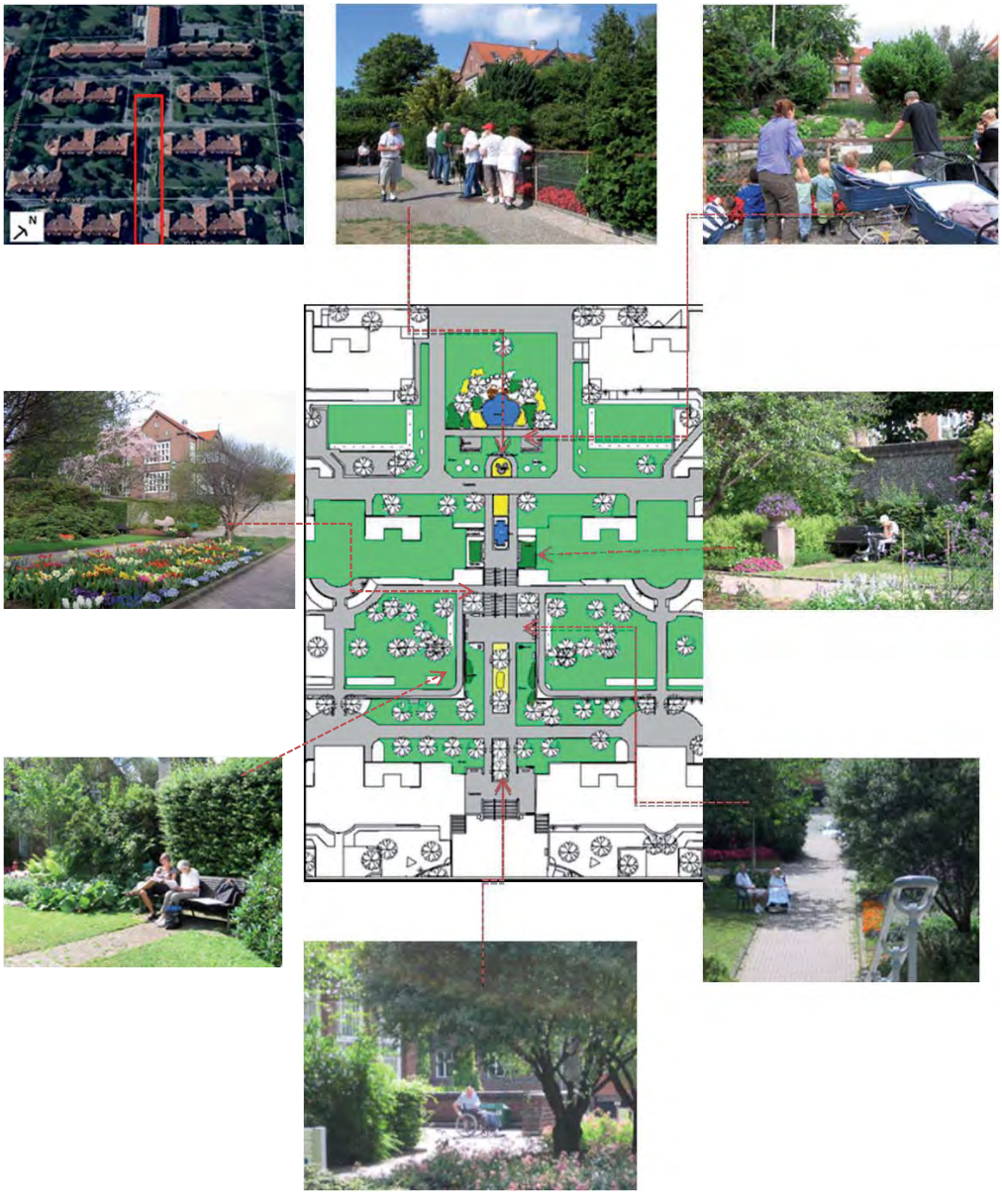

Figure 4 *Bispebjerg Hospital: Location of the selected area; the plan, and photos of the GOE.*

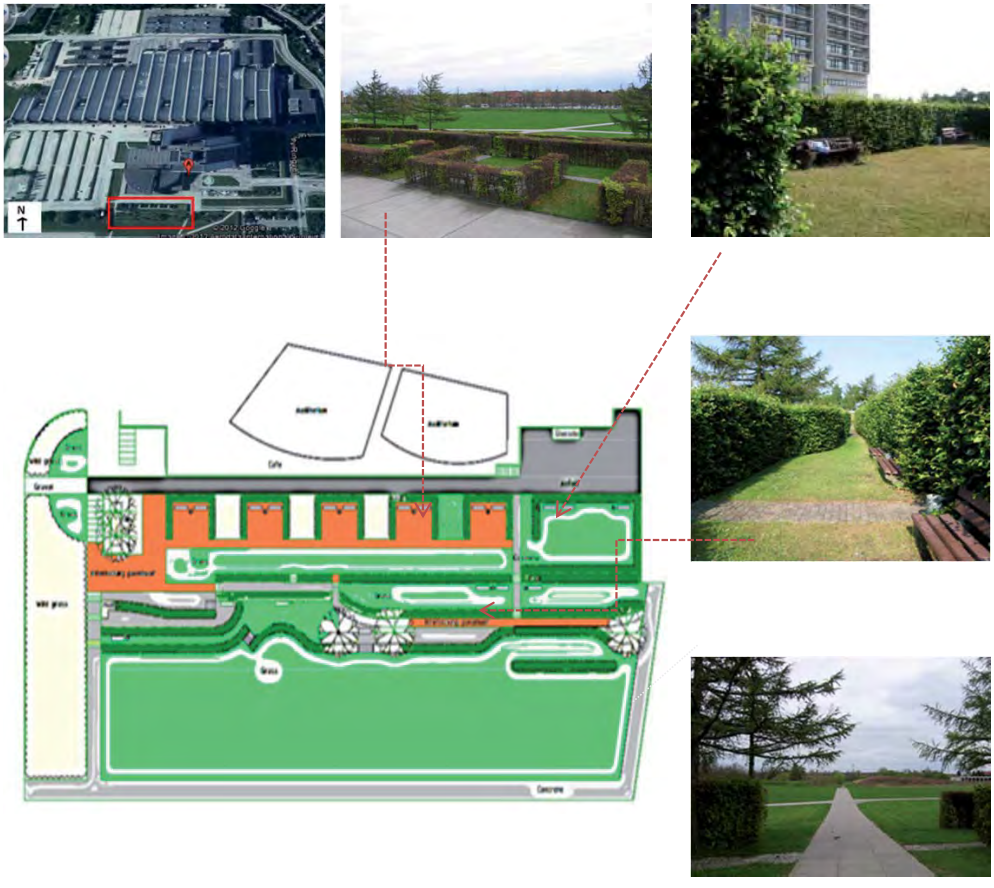

Figure 5 *Herlev Hospital: Location of the selected area; the plan, and photos of the GOE.*

Hillerød Hospital

Hillerød Hospital is located in the north planning district of Copenhagen and is surrounded by residential areas. The hospital building was completed in 1943 and there are currently 2,869 employees working at the hospital which serves 350,000 residents. The GOE which is located next to the hospital's main entrance and parking areas was selected as the study area as it is accessible to all users. The approximate size of the selected GOE is 1,800m^2. The GOE has an open design and resembles a small plaza and it is dominated by hard paved surfaces with benches, waste bins, a signage and a sculpture. Most of the plants are placed in containers. Mature trees grow on a slope which separates the main road from the hospital grounds and on small islands near the parking areas.

Figure 6 *Hillerød Hospital: Location of the selected area; the plan, and photos of the GOE.*

Hvidovre Hospital

Hvidovre hospital is located in the south planning district of Copenhagen and there are currently 3,221 employees working at the hospital which serves 460,000 residents. The hospital buildings were completed in 1970 and the hospital's GOE is located on the roof of the buildings. Only the front GOE areas located near the cafes, a hair salon and a children's ward were selected for this study as they were observed to be the most frequently used. The size of the case study is approximately 8,000m^2. Due to its location, the GOE cannot be seen from the ground level entrance. The GOE has a formal, post-modern design. The users are provided with many possible routes in the GOE and the facilities include multiple choices of seating, e.g. picnic benches, moveable seats and seats placed in the shade and out in the open. There are some water features in the GOE but they have been turned off when the study was conducted and are currently dry ponds. The GOE is at the same level as the wards but the way the GOE has been designed provides the patients inside the wards with a certain degree of privacy, even though users of the GOE walk past the wards.

Rigshospital

Rigshospital is part of Copenhagen University Hospital, together with the Faculty of Health Sciences at the University of Copenhagen. There are currently 7,184 employees serving an estimated 600,000 residents. The selected GOE is situated within the complex of the hospital buildings and was opened in 2006. The size of the selected GOE is approximately 6,000m^2. The GOE has an urban, modern design and is accessible from the ground floor. The GOE is surrounded by hospital buildings and the

ground level houses the children's ward, a cafeteria, a library, an auditorium and offices. There are several entrances into the GOE. The facilities provided include a playground, sculptures, covered and open seating areas, and moveable and fixed seats. The water features are not operational and are just low, dry ponds which were often seen being used as seating areas. Other than the hospital staff, patients and visitors, the GOE is also used by non-hospital users such as children from a nearby kindergarten.

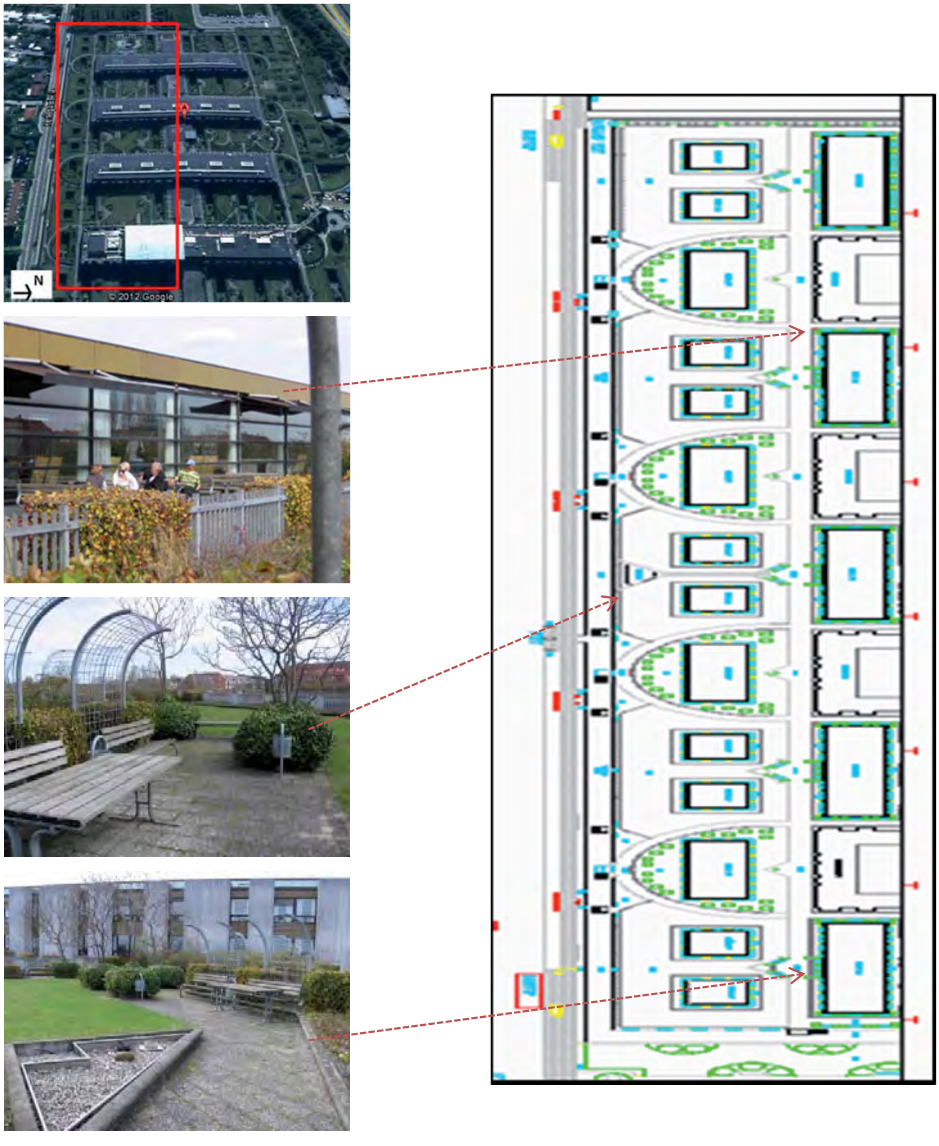

Figure 7 *Hvidovre Hospital: Location of the selected area; the plan, and photos of the GOE.*

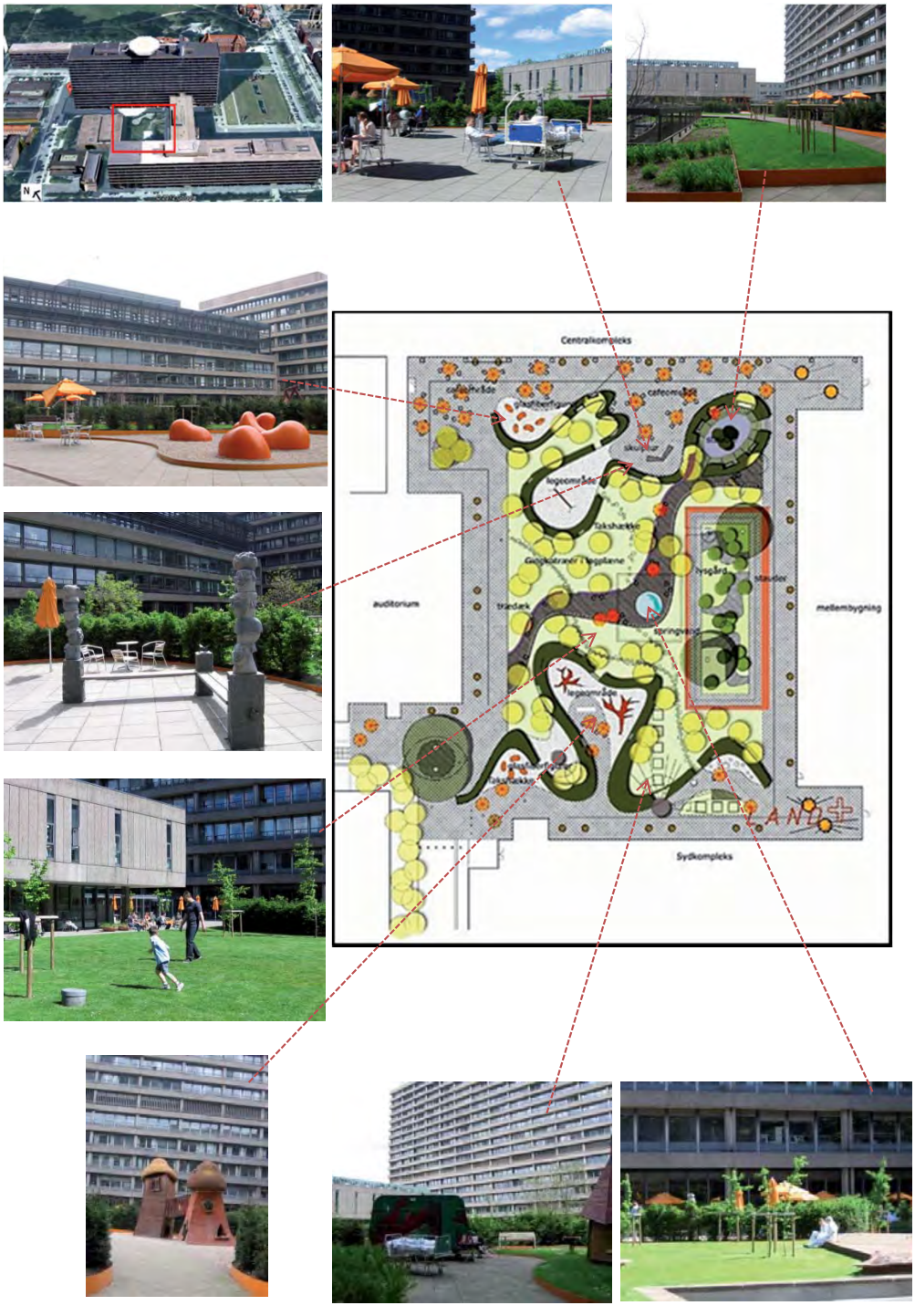

Figure 8 *Rigshospital: Location of the selected area; the plan, and photos of the GOE.*

3.1.3 Questionnaire Survey (Paper II, III and IV)

In order to acquire an overview of use and perception of the GOE, a quantitative approach using a questionnaire survey was carried out. Closed questions were used to obtain information regarding demographics; the activities and time spent in the GOE; preferred features in the GOE and the users' level of satisfaction with the GOE. The questionnaire was based on several similar studies on the use of hospital GOEs (Cooper Marcus, 1999; Said et al., 2002; Sherman et al., 2005; Whitehouse et al., 2001). The questionnaire consisted of five parts. The first part of the questionnaire asked respondents how long they had spent in the GOE and which activities they had performed there. The time categories were 5-10 minutes; 11-20 minutes; 21-30 minutes; 31-60 minutes and more than 1 hour. The 17 activities were 'having my lunch'; 'sitting & talking'; 'sitting & relaxing'; 'having a quick chat'; 'walking around'; 'using my cell phone'; 'sitting & waiting'; 'sitting quietly/contemplating'; 'reading a book'; 'relaxing & resting'; 'getting away from a stressful environment'; 'enjoying the garden'; 'walking through; 'forgetting my worries'; 'exercising'; 'smoking' and 'work meeting'.

The second part of the questionnaire focused on the respondents' perceived restorative potential of the GOE and included the Perceived Restorativeness Scale (PRS). The PRS is based on the Attention Restorative Theory (ART) components; 'being away', 'fascination' and 'compatibility'. Regarding the variation in size of the GOE, 'scope' and 'coherence' were included in the PRS while 'extent' was excluded due to the variation in GOEs (Tenngart and Hagerhall, 2008). The scores from the PRS were later verified if the GOEs corresponded with the natural scene types using a score ranking from a related study by Purcell et al. (2001). The version used in this study was developed by Bodin and Hartig (2003) and consisted of 24 questions. Five items were evaluated for the component 'being away' (e.g. this place is like a refuge from things that distract me); five items were evaluated for the component 'fascination' (e.g. this place stimulates my curiosity); four items were evaluated for the component 'coherence' (e.g. this site is designed in accordance with a clear plan); three items were evaluated for the component 'scope' (e.g. I feel that this place is a small world in itself); six items were evaluated for the component 'compatibility' (it is easy to do what I want here) and one item was evaluated for 'preference' (I like this place). The respondents had to mark their experiences on an 11 point Likert scale ranging from the lowest '0' (not at all) to '10' (completely).

The third part of the questionnaire focused on the opinions of the respondents regarding how much they had enjoyed the different features in the hospitals' GOEs. The features included 'water', 'shelter (such as trellis, gazebo)', 'vegetation (such as trees, flowering shrubs)', 'lawn', 'fresh air', 'breeze', 'sunshine' and 'bird song'. The possible response categories ranged from the lowest '0' (not at all) to '10' (completely).

The fourth part of the questionnaire focused on the respondents' level of satisfaction with the hospital GOE. They were asked '*are you satisfied with the hospital's outdoor garden?*' with the possible response categories being 'very satisfied', 'satisfied', 'neither satisfied/nor dissatisfied'; 'dissatisfied' and 'very dissatisfied'.

The last part of the questionnaire asked about the respondent's personal data, such as gender, age, country of birth, educational level and marital status. As for the age groups, the grouping was based on Statistics Denmark's (2011) education and working age group, while the classification of the education group was based on The International Standard Classification of Education (ISCED). The questionnaire used for the actual data collection was approved by the Danish Data Protection Agency. The statistical analyses were conducted using SPSS version 19 and descriptive statistics (frequencies and cross-tabs), and a significance level of 0.05 was used. A series of analysis based on the PRS components were carried out and Post Hoc tests, using Duncan's alpha, for each of the subscales were performed which determined the scores regarding the restorative value of each of the GOEs.

3.1.4 Personal interviews with hospital staff

The personal interview method is described in full as the method has not been discussed in the papers. Face-to-face interviews using semi-structured questions were used to explore staff's opinions and use of the GOEs. Furthermore, the interview aimed to acquire information that could not be accessed through the questionnaire. The rationale for the interviews was to gain deeper understanding of how employees use the five hospital GOEs and to better understand their experiences when they use the GOE and what they like/dislike about the areas. Hospital employees were chosen for the interviews as they were considered to be the most knowledgeable about the hospitals' environments as they spent the most time at the hospitals (Said, 2006; Sherman, 2005). In total, 15 staff members, three from each hospital, were selected for the interviews. The participants consisted of 11 women and 4 men. All participants were aged between 20 and 60 years and had been working at the acute care hospitals from just a few months to up to about 20 years. The participants joined the study voluntarily. Each interview lasted between 45 minutes to one hour.

Content analysis was conducted on the interview data following guidelines for qualitative research (Patton, 2002). The raw data, i.e. the transcription of the personal interviews, were systematized into different themes by using the software Nvivo 8 (computer-assisted qualitative data analysis software) to highlight the key points from the interviews, and later to assist when summarizing and linking similar themes together. Meaning condensation was applied when transcribing the interviews which is an analytical approach which involves writing shorter formulations of what has been said without losing the meaning (Kvale and Brinkmann, 2009).

3.1.5 The Common Design Recommendations (CDR) tool

The Common Design Recommendations (CDR) tool was used to evaluate the GOEs and identify their design characteristics. The tool was developed from the systematic search carried out in Paper I. The analytical framework is based on a garden audit tool by Cooper Marcus and Barnes (2010) and design guidelines from Tyson (1998). There are six major design recommendations in Cooper Marcus and Barnes' (2010) tool: 1) location and entry to garden (e.g., create easy access); 2) layout and pathway (e.g., create privacy with plants); 3) seating (e.g., create many seating choices); 4) planting (e.g., use variety of plants); 5) design details (e.g., provide signage); and 6) maintenance and amenities (e.g., maintain plants well).
Tyson design recommendations include: 1) indoor and outdoor (e.g., create easy access); 2) garden view (e.g., create gardens to overlook distance view); 3) pathway and landmark (e.g., create pathways to connect the spaces); 4) garden places (e.g., create variety of spaces); 5) furnishings (e.g., provide variety in seating); 6) planting (e.g., provide colorful plants); and 7) enclosure (e.g., relate the material in the garden with the building).

Design recommendations that were mentioned in the 21 reviewed publications (Paper I) were added to the framework and included welcoming garden entrances, accessible paths, way finding systems, and storage facility for maintenance tools. The synthesizing of these design frameworks and design recommendations resulted in seven design recommendation categories (Table 1). A total of 22 design concerns are found in the CDR and it aims at being used by a researcher to evaluate and marked the presence of design concerns through the observation of the GOE.

Table 1 *The Common Design Recommendations (CDR) tool which has seven themes with 22 design concerns.*

The CDR
Location and view
• Locate the garden near common facilities
• Create welcoming garden entrances
• Provide views of the garden from inside the building
Accessibility
• Ensure easy access
• Ensure paths are accessible for all
• Provide a way finding system for easy navigation
Layout and space
• Create hierarchy and variety for different spaces and paths
• Create transitional space between indoors and outdoors
Seating arrangement
• Offer different sorts of seating
• Offer both fixed and moveable seats
• Provide both open and covered seating
Planting
• Use plants that offer multi-sensory experience
• Use native plants
• Use plants which attract birds and insects
• Avoid toxic and allergy-triggering plants
Design details
• Use colors in hardscape material to create contrast
• Include play elements
• Include water features
• Include sculptures
Practical services
• Include drinking fountains
• Provide restrooms
• Provide storage for maintenance tools

4.0 SUMMARY OF RESULTS

The following section is summarization of the results according to the four research questions. The detailed results can be found in each paper.

4.1 RQ1: State-of-the-art in design recommendations for GOEs at healthcare facilities (Paper I)

The systematic search yielded 21 publications that met the selection criteria, of which ten were peer-reviewed papers and 11 were best practice guidelines. The review found a lack of evidence-based design recommendations. The review identified a strong focus on the benefits for patients but less attention to the benefits for visitors and staff. The paper resulted in a list of design recommendations which were identified, and later summarized. A list called Common Design Recommendations (CDRs), which is a condensed version of that found in the literature review, could be used as a tool to evaluate existing and future GOEs at healthcare facilities. The tool consists of the following categories: 1) location and view; 2) accessibility; 3) layout and space; 4) seating arrangement; 5) planting; 6) design details; and 7) practical services. In general the design recommendations from the reviewed literature suggested that GOEs at healthcare facilities should 1- be visible and in physical contact with the healthcare facility; 2- be easily accessible with easy way finding; 3- offer options in usage; 4- provide sensory stimulation and 5- offer comfort all year around.

4.2 RQ2: Users' characteristics, the usage and preferences of GOEs (Paper II & III)

Users' characteristics

A total of 463 users of the GOEs answered the questionnaire (Table 2) and they were divided into the following three user groups: staff (n=183), patients (n=149) and visitors (n=131). The GOEs are used almost equally by men and women. The majority of the users ranged between 25 and 54 years old. There seems to be an over-representation of respondents with short educations (primary level). The detailed results regarding the staff are discussed in paper II, while the results concerning the patients can be found in paper III.

Table 2 *Category of respondents who answered the questionnaires at the five hospitals' GOEs.*

Respondent category	**Hospitals (N-463)**						
	Bispebjerg n=101	Hillerød n=70	Herlev n=81	Hvidovre n=88	Rigshospital n=123	Total	Percentage
Staff (n)	53	22	32	36	40	183	39.5
Patients (n)	25	29	24	30	41	149	32.1
Visitors (n)	23	19	25	22	42	131	28.2

GOE usage

Smoking was the most reported activity performed by users in the GOEs and was carried out between 5 and 10 minutes (Figure 9). The results also show that smoking is reportedly more frequent among patients and visitors while they (especially patients) also spend more time on this activity (11 to 20 minutes). The results also show that smoking is more often carried out in enclosed areas such as at Herlev Hospital compared to GOEs with a more open design such as at Rigshospital. Having lunch in the GOE is another common activity and the results indicate that some users, especially staff, frequently eat lunch in the GOE compared to the patients and visitors. Regarding the duration of stays, staff spent more time in GOEs which were nearer their work stations such as the GOE at Bispebjerg Hospital. Patients, on the other hand, seem to spend more time in the gardens in order to get away from a stressful environment compared to the other user groups. Patients and visitors spent more time in Hvidovre Hospital and Rigshospital's GOEs compared to the other case studies with stays lasting from 31 minutes to 1 hour. Besides smoking and having lunch, other activities that were frequently carried out in the GOEs included using cell phones, sitting and relaxing and walking around. More detailed information concerning staff and patients' use of the GOEs can be found in Papers II and III respectively.

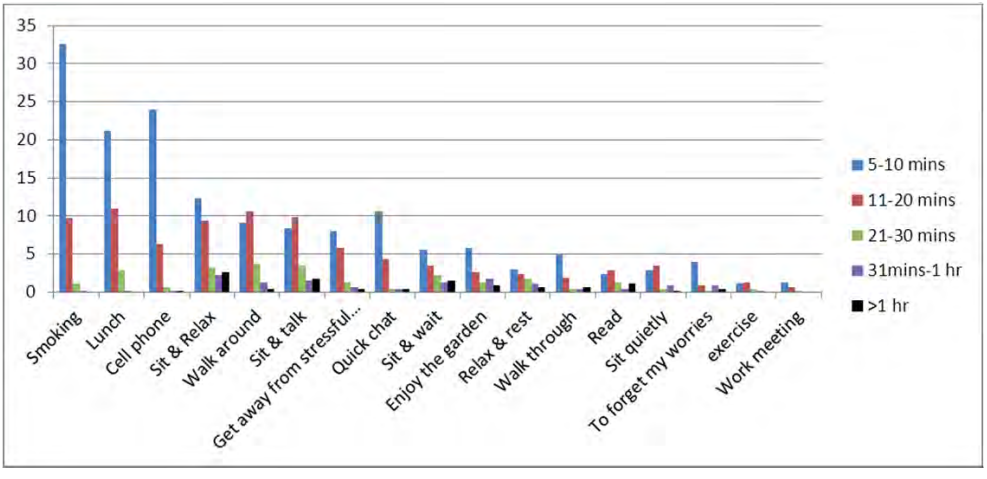

Figure 9 *Percentage of time spent on the activity by respondents*

The preferences

Natural elements such as fresh air, sunshine and vegetation are most preferred by the users (Figure 10). Among the hard landscape elements, water features were the most popular according to the respondents. The respondents were also asked to state their level of satisfaction with the GOE they used (Table 3). The GOE at Bispebjerg Hospital achieved the highest level of satisfaction amongst its users while users at Hillerød Hospital were the least satisfied with the GOE.

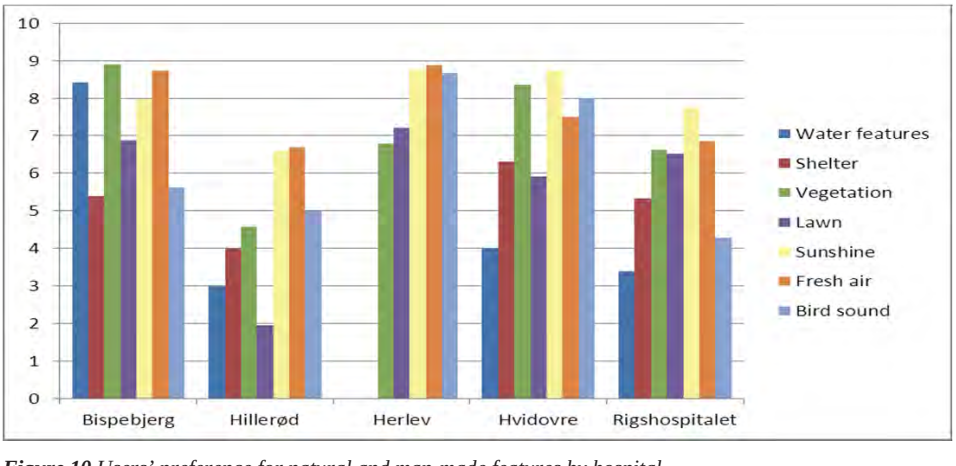

Figure 10 *Users' preference for natural and man-made features by hospital*

Table 3 *Percentage of users satisfied with the GOE at each hospital*

Hospital	***Satisfaction with the hospital GOE (%) N=463***					
	Very satisfied	Satisfied	Neither/ nor	Disssatisfied	Very dissatisfied	Total
Bispebjerg (n=101)	**76.2**	23.8	0	0	0	100,0
Hillerød (n=70)	0	18.6	**57.1**	17.1	7.1	100,0
Herlev (n=81)	0	**50.6**	49.4	0	0	100,0
Hvidovre (n=88)	19.3	**67.0**	8.0	3.4	2.3	100,0
Rigshospital (n=123)	22.8	**65.9**	9.8	0.8	0.8	100,0

Furthermore, concerning the preferences, the personal interviews identified suggestions from the hospital staff. The results are not presented in the papers so they are discussed here as the findings are considered significant for this study. Each interview was analyzed and six main themes were identified from the interviews with the staff. Theme one, *ensure easy accessibility,* describes the employees' preference for having a GOE close to their work station. The second theme, *having private areas* describes the employees' need for a private area in the GOE. The third theme, *provide window view* is important that employees enjoy a view even if they can not go out. *Designing GOE for other users* is the fourth theme which captures employees' suggestion that GOEs should be designed for the clients, i.e. the patients. The fifth theme, *include water features,* is something that many employees mentioned as their preferred garden feature was a water feature. The last theme, *creating outdoor rehabilitation/training/exercise areas*, captures employees' desire to use the GOEs as places to train during breaks as well as places where patients can also train.

4.3 RQ3: The restorative benefits (Paper II, III & IV)

After evaluating the respondents' answers to the questionnaire, a pattern in the ranking of the GOEs in relation to the PRS score became apparent (Figure 11). The GOE at Bispebjerg Hospital has the highest scores for all components, while Hvidovre and Rigshospital could be said to be in the *medium high* group, while Herlev is in the *medium* group. The GOE at Hillerød Hospital is in the *low* group regarding the PRS scores in all components.

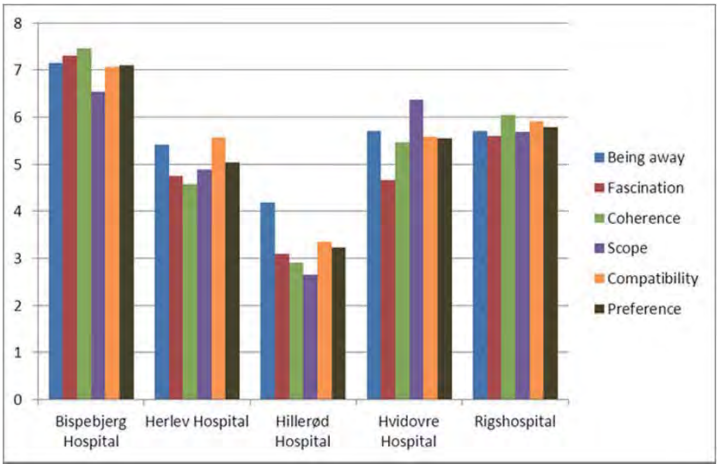

Figure 11 *The average PRS scores for the restorative value of each hospital's GOE*

4.4 RQ4: What are the design characteristics of the GOEs and which are perceived as the most restorative? (Paper IV)

The design characteristics were analysed by using the common design recommendation (CDR) tool for healthcare facilities (Table 4) which was the result of Paper I. The data from the questionnaire regarding the Perceived Restorativeness Scale (PRS) were also used to identify the GOE with the highest restorative quality. The results show that Bispebjerg Hospital has the highest average score for restorative environments and exhibits design characteristics in relation to three of the CDR's themes (*location and view; layout and space*; and *seating arrangement*s). Compared to the other GOEs, the GOE at Bispebjerg Hospital has the advantage of possessing water features while efficient and regular maintenance is also carried out at Bispebjerg compared to the other GOEs.

Table 4 *An evaluation of the five GOEs using the CDR*

The CDR	**Bispebjerg Hospitals**	**Herlev Hospitals**	**Hillerød Hospital**	**Hvidovre Hospital**	**Rigshospital**
Location and view					
Locate the garden near common facilities	√	√	√	√	√
Create welcoming garden entrances	√	-	-	√	√
Provide views of the garden from inside the building	√	-	-	√	√
Accessibility					
Ensure easy access	√	√	√	√	√
Ensure paths are accessible for all	-	-	√	√	√
Provide a way finding system for easy navigation	-	-	-	√	-
Layout and space					
Create hierarchy and variety for different spaces and paths	√	-	-	√	√
Create transitional space between indoors and outdoors	√	-	-	√	√
Seating arrangement					
Offer different sorts of seating	√	-	-	√	√
Offer both fixed and moveable seats	√	-	-	√	√
Provide both open and covered seating	-	-	-	√	√
Planting					
Use plants that offer multi-sensory experience	√	-	-	√	√
Use native plants	√	√	√	√	√
Use plants which attract birds and insects	√	√	-	√	√
Avoid toxic and allergy-triggering plants	√	√	√	√	-
Design details					
Use colors in hardscape material to create contrast	-	-	-	-	√
Include play elements	-	-	-	√	√
Include water features	√	-	-	√	√
Include sculptures	√	-	√	√	√
Practical services					
Include drinking fountains	-	-	-	-	-
Provide restrooms	√	-	-	-	-
Provide storage for maintenance tools	-	-	-	√	-

5.0 DISCUSSION

The overall findings of this PhD thesis show that users seem to acknowledge that the GOEs at the acute care hospitals have potential as restorative settings. Although only five hospitals were selected, the results provide an overview of the information regarding the user group and their common activities which could serve as a guide when designing GOEs at acute care hospitals.

5.1 User characteristics

The results answered one of the research questions and identified the characteristics of the GOE users. In addition, the results support prior findings especially concerning usage of the GOE among the employees which is lacking in many publications. Of the questionnaire respondents, over 70% were female at Bispebjerg and Hvidovre hospitals while it is almost equal gender at other hospitals. However, while the male to female ratio was on average 20:80, the results show that male staff members use the GOE slightly more than their female colleague at all five hospitals (Paper II). This finding is consistent with Lottrup et al. (2012) who reported greater usage of GOE at work places among males. Furthermore, based on the total number of employees from the five hospitals and the rate of occupancy for hospital beds, it can be said that employees use the GOEs more often than other users (see paper IV). Therefore, this study supports the need to focus on employees as recommended by others (Naderi, 2008; Sherman et al., 2005). However, more needs to be done also for the patients. The results of the study reveal that young patients do not use the GOEs very often which may be due to a lack of facilities for children at the GOEs. Play equipment can easily be seen at Rigshospital (Photo 3) while at Hvidovre Hospital, a play area is located far from active areas and the equipment is underutilized. In order to increase the number of young users, Sherman et al. (2005) suggest that hospitals should include programs that actively encourage children and families to use GOEs. Rigshospital is the only hospital which has an active program for pediatric patients in the GOE especially during the warmer season.

Photo 3 *Features for children in the GOE at Rigshospital include the sculpture (L) and 'The Red Dragon' wagon (R) which is used for story-telling during the summer.*

5.2 GOE usage

The activities frequently mentioned by users could indicate which types of spaces and facilities are needed in the GOE. In Paper II, employees mentioned that they don't have much time to spend in the GOE and when they do it is usually for lunch. During the interviews, the majority of employees also mentioned that it was important that the GOE was easily accessible from their work stations (Photo 4). This suggests that the GOEs should be located close to employees' work areas, which is supported by other studies (e.g. Bengtsson and Carlsson, 2006; Kearney and Winterbottom, 2005; Rodiek and Lee, 2009; Shackell and Walter, 2012).

Photo 4 *The view of the GOE taken from the window of an employee's work station at Hvidovre Hospital. The GOE is easily accessible from the work station.*

Easy access was also identified in Paper III as being the most important aspect regarding patients' use of the GOE, which is supported by other studies (see e.g. Kearney and Winterbottom, 2005; Rodiek, 2005). The results (Paper III) indicated that patients use the GOEs that are easily accessible more, even though the GOEs do not provide many attractions (Photo 5 and 6).

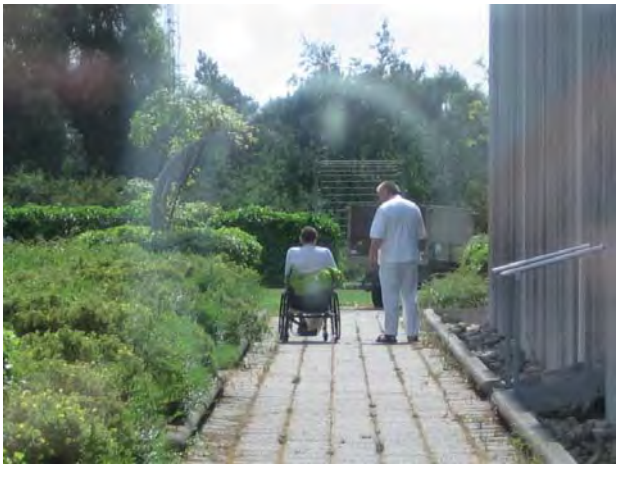

Photo 5 *The entrances to the GOE at Hvidovre Hospital are designed with ramps and the majority of the pathways are straight and are constantly used for patients' outdoor training.*

Photo 6 *Easy access to the GOE at Rigshospital is apparent and patients are moved out on their beds into the GOE when the weather is good.*

The interview with the employees also identified two important aspects often mentioned by similar studies concerning the use of GOEs (Photo 7 and 8). The first is that the employees requested a window view of the GOEs (Pati et al., 2008; Stichler, 2009) and secondly private areas for staff (Naderi, 2008; Sherman et al., 2005). Furthermore, the interviews provided evidence to support the Theory of Supportive Gardens by Ulrich (1999) as employees mention all the four aspects related to the theory: 1- sense of control, which is the need for temporary escape and privacy (staff mention the need for private areas in the GOE); 2- social support (employees mention using the GOE for activities that socially and emotionally support the patients); 3-physical movement and exercise (employees suggest the inclusion of an area for exercise and the patients' rehabilitation); 4- natural distraction (employees mention that they use the GOE to get away from stressful environments).

Photo 7 *The water features in the GOE at Bispebjerg Hospital can be viewed from the employees' work stations*

Photo 8 *An employee at Bispebjerg Hospital took this photograph when asked to show her favourite private area in the GOE*

Among the activities, smoking is one of the most frequently performed in the GOEs. Smoking in the GOEs is a common sight even though it is prohibited on hospital grounds. However, less of this activity was reported at Rigshospital where an area next to the GOE has been allocated for smokers. Therefore, the hospital management, designers and planners should consider creating an area for smokers as Marcus and Barnes (1999) and Shepley (1998) have highlighted that smoking is considered a negative distraction for many users of GOEs.

Photo 9 *The structure located in the GOE at Rigshospital intended for smoking*

Results also show that patients spent longer time, mostly for sitting (Paper III) and areas which can provide privacy are important for the patients (Bodin and Hartig, 2003; Whitehouse et al., 2001). This could explain why enclosed GOE such as at Herlev Hospital is found to be used the most for private activities such as using cell phone and for lunch by the patients (Photo 10).

Photo 10 *The enclosed space planted with fragrant plants provides the privacy and comfort needed by users of the GOE at Herlev Hospital.*

5.3 The perceived restorative quality of the GOE

The use of the Perceived Restorativeness Scale (PRS) in the questionnaire revealed which GOEs is regarded by users as having the most restorative settings. GOEs which have a more natural setting are preferred as indicated by the score at Bispebjerg Hospital. According to the 'Attention Restoration Theory'(Kaplan, 1995), natural settings are more likely to contain the components of a restorative environment. In addition, the GOE at Hillerød Hospital, which is perceived as an 'urban scene' received a low rating from the users in the PRS. Studies on preferences for natural versus urban scenes, e.g. Ulrich (1993) provide support for the biophilia hypotheses. Ulrich (1993) mentions that there is a strong tendency for diverse groups, including Europeans, to prefer natural scenes to built views especially if the latter lack natural contents such as vegetation and water. The GOE at Bispebjerg Hospital received a high PRS score which may be due to the presence of water features (Photo 11). The water features at the other four hospitals were not turned on and had the appearance of 'dry ponds'. Water features may provide users with relief from stressful environments ('being away') and offer fascination derived from the stimulus of viewing the water (Kaplan, 1995). Whitehouse et al. (2001) reported that the sound of running water is the most popular according to GOE users. However, the GOE users at Bispebjerg Hospital may also be drawn to the GOE because of its historical character and the architectural beauty of the buildings which surround the hospital (Staats et al., 2003).

Photo 11 *The two water features in the GOE at Bispebjerg Hospital.*

Of the scores received by Bispebjerg Hospital in the PRS, 'scope' is the lowest compared to the other components. When comparing all five hospitals, Hvidovre received the second highest score in the overall 'scope' category, after Bispebjerg Hospital. This is not surprising as the GOE at Hvidovre is the largest case study area and is thus likely to trigger a rating based on the directly visible size aspect (Tenngart and Hagerhall, 2008). This study somehow provides some evidence that 'scope' is a sensible subscale of perceived restorativeness as the GOE at Bispebjerg Hospital is among the smallest, but patients still gave it a high score in terms of 'scope' (Photo 12).

Photo 12 *The view towards the GOE at Bispebjerg Hospital which is among the smallest of the GOE case studies*

5.4 The design characteristics

A detailed explanation of each hospital's design setbacks and positive aspects which contributed to the identification of the design recommendations can be found in Paper IV. As stated in Paper I, no single blueprint can satisfy all users' needs in GOEs, and therefore, the results illustrate that the design recommendations not only apply to acute care hospitals but also to other healthcare setting. Applying the CDR to the case studies facilitates a quick evaluation of the characteristics of the GOEs.

The GOE at Hvidovre Hospital can not be seen from the main entrance of the hospital as it is located on the rooftop, which means that many potential users are unaware of its existence. Furthermore, at Hvidovre Hospital, only the areas which are close to the facilities are used which means that some areas are underutilized. Regarding accessibility to the GOE at Bispebjerg Hospital, despite the staircase in the middle of the area causing patients with wheelchairs or crutches difficulty, the GOE is still popular among the hospital users and it is also used by the nearby community (Photo 13). Furthermore, the GOE is well-maintained throughout the year with vegetation which provides colours and fragrance.

Photo 13 *The lack of easy access does not hinder patients from using the GOE at Bispebjerg Hospital.*

The vegetation at Bispebjerg Hospital is designed to create pocket spaces which provide privacy. Appleton's Prospect-Refuge Theory (1975) mentions the term, 'refuge' may serve as a shelter and for feeling safe. This setting can be seen at the GOE at Bispebjerg Hospital and this may explain why many users mentioned they prefer the GOE here to get away from stressful environments compared to the other hospitals.

Herlev Hospital was mostly used for quick activities of which smoking, cell phone use and having lunch were the most popular compared to the other hospitals. The enclosed spaces of the GOE at Herlev Hospital provide the privacy for users to carry out these activities (Photo 14). However, the range of activities performed at the GOE at Herlev Hospital was rather limited which may be due to the fact that the facilities are limited to benches and waste bins.

Photo 14 *The high hedges conceal the GOE at Herlev Hospital from being seen from inside the building.*

Rigshospital has the advantage that its location makes it easily accessible from the buildings while it is close to many facilities. In addition, the GOE at Rigshospital has the highest score in the design detail category (Photo 15). The play elements and sculptures may have made the GOE attractive to many users and this may explain why 'enjoying the garden' is the most frequently mentioned activity at Rigshospital compared with the other hospitals.

Photo 15 *The flexibility of the design allows young patients to express themselves at the GOE at Rigshospital.*

The generally low scores from the questionnaire and the CDR tool confirm that Hillerød Hospital has the least popular GOE and has the least restorative environment. Paved areas dominate the GOE and no clear demarcation between the GOE and the parking areas is apparent (Photo 16). However, the GOE has potential as it is located by the main entrance, close to parking areas and a bus stop and is surrounded by residential areas. The GOE here did not seem to provide much interest for prolonged use due to the lack of facilities and vegetation.

Photo 16 *Entrance to Hillerød Hospital.*

The findings from this study support prior design recommendations which have been suggested by others (e.g. Asano, 2008; Cooper Marcus and Barnes 1999; Davis, 2011; Johnson, 2002; Shackell and

Walter 2012; Ulrich, 2002). Different types of spaces that offer psychological and social benefits such as peacefulness, the opportunity to retire to secluded places, or the opportunity to interact with others are considered important design concerns (e.g. Cooper Marcus and Barnes, 1995, 1999; Whitehouse et al., 2001). The GOEs have to satisfy different users (patients, staff and visitors) and their needs, e.g. a place for privacy, a place to eat lunch, or a shady or sunny place to sit. The GOE can also be an asset as a link with the local community through the facilities provided in the GOE (Photo 17).

Photo 17 *A group of nearby elderly residents who use the GOE at Bispebjerg Hospital for walking exercise once a week during the summer*

5.5 Discussion of methods

5.5.1 Literature review

Relevant websites may have been overlooked due to the choice of key words and inclusion criteria may have eliminated potential recommendations. The use of guidelines from Cooper Marcus and Barnes (2010) and Tyson (1998) as the analytical framework could be argued. However, this framework is seen as the most comprehensive as the guidelines are constantly referred to in this area of study. Furthermore, both publications have shown similarities that helped organizing the results from all the other reviewed publications. Nonetheless, the review managed to provide an overall picture of the current status concerning the design of GOEs at healthcare facilities. According to Viets (2009), the literature review serves to gather and synthesize key studies concerning the field of GOE design so that researchers and designers can read a synopsis of a series of studies.

5.5.2 Case study selection

The strength of the study is that it includes five cases which were identified by a selective and systematic process to ensure cases that represent also other acute care hospitals in Denmark. The five case studies provided a varied dataset in terms of the use and design of GOEs. The method used achieved the objectives of this study which were to determine the general use and preferences of the users of the hospitals' GOEs. Due to time limitations, only GOEs that are often used in each hospital were considered while other green areas in other parts of the hospitals were excluded. Significant information on the excluded GOEs at the hospitals may have been overlooked. For a future study, it would be interesting to include a greater number of hospitals in Denmark and conduct comparisons with other Scandinavian hospitals.

5.5.3 Questionnaire survey

The questionnaire was distributed to the actual users on-site with the intention of carrying out evaluations of the GOE based on the users' direct experience at each hospital. However, the questionnaires were only distributed to those who chose to be in the GOE, thus leading to the possibility of a biased sample. Future studies should include a control group consisting of individuals who do not use the GOEs at the hospitals. However, potential respondents among the staff may be higher as many employees found using the GOE refused to participate due to their short break time.

5.5.4 The Common Design Recommendations (CDR) tool

Using the CDR, GOE at Hvidovre and Rigshospital exhibited design considerations from five out of the seven CDRs. However, Bispebjerg Hospital, which conformed to only three CDRs, was regarded as having the most restorative potential. This illustrates that even though the GOE at Bispebjerg is small, other aspects such as the surrounding buildings and facilities such as working water features and well-maintained vegetation mean that it is the most restorative GOE according to the users. The analysis of the five GOEs according to the CDRs and the PRS has led to the identification of design recommendations for future hospital GOEs. The CDR could be a reliable tool to use as a guide when designing and assessing GOEs at acute care hospitals. As this is the first study which uses this method, it gives a rather general view of the GOEs. There may be other additional factors not included in the CDRs which the GOEs might have in common. The CDR factors which are partly or wholly responsible for the higher PRS have potential for further research. An analysis of a greater number of GOEs would mean that more features of the GOEs could be tested and identified by their individual characteristics. Furthermore, a greater number of GOEs would facilitate the application of regression analysis to show how each feature in the GOEs affects the users. Paper I and IV identified the maintenance aspect as being the weakness among the GOEs at healthcare facilities. Therefore, the CDRs could be improved by including recommendations regarding the maintenance of GOEs as the results from this study have shown that well-maintained GOEs are more attractive and are preferred by users.

6.0 CONCLUSION AND FUTURE PERSPECTIVES

The overall aim of this PhD study was to gain deeper knowledge about the design and use of GOEs which supports mental restoration. All five GOEs were good case studies either due to their positive or limitations in the design characteristics. The results from analysing the five GOEs also contribute to the existing information concerning the design of GOEs at healthcare facilities. This study is considered applicable as a source of information for hospitals located in other parts of the world, as the theoretical framework and internationally validated methods were used. Because the data was collected during a warm period, the results are also assumed to be relevant for countries with a warmer climate. The results presented could be used by researchers and could provide practitioners involved with the design and management of hospital GOEs in many parts of the world with recommendations.

6.1 Implications for practice

This study did not intend to create a blueprint for GOEs which could be applied to all acute care hospitals. The design recommendations for restorative settings at acute care hospitals based on the five case studies warrants new research that focuses on more GOEs. The context of use of GOEs at Denmark's acute care hospitals adds new knowledge, especially to the field of the design of health supportive outdoor environments. The result of Paper I, i.e. the formulation of the Common Design Recommendations (CDR) should not be considered as a completed list as new research is being published on this topic and thus the tool will evolve and be improved. The seven condensed themes (location and view; accessibility; layout and space; seating arrangement; planting; design details and, practical services) in the CDR tool (Paper I) or with the 13 recommendations (Paper IV) can act as a guide, especially if the GOE is to be developed on a restricted budget and with limited space. As

indicated in the GOE at Bispebjerg Hospital, the area does not have to be large and the design does not necessarily have to comply with all the categories in the CDR. Understanding the needs of the users will also help to create a GOE that is frequently used.

6.2 Future research

As previously mentioned, there are a number of aspects which could be improved with further research. For example, future research could analyze a greater number of GOEs which would mean that more features in the GOEs could be tested and identified by their individual characteristics. Variation in terms of the design of GOEs would allow broader comparisons through the use of landscape analysis on each GOE. Studies could investigate larger green areas, such as the entire green infrastructure at hospitals, and attempt to determine which areas are used most frequently. This study identified the maintenance aspect as being the weakness among the healthcare facilities' GOEs. Therefore, the CDRs could be improved by including recommendations regarding the maintenance of GOEs. The CDR tool as well as the information on the use of the GOEs may inspire and influence future studies. The tool is applicable to all healthcare facilities where it can be applied to quickly evaluate existing GOE or be used as a guide for the design of future GOEs.

The gender difference and the difference between outpatients and inpatients regarding the use of GOEs would be an interesting topic for future study. The use of personal interviews with employees provides in-depth information regarding a specific user group. Although the results from the interviews are not presented in any of the papers, the findings are informative and suggest avenues for future research. The findings in the interviews show similarities among the staff from the different acute care hospitals concerning their needs and use of GOEs at the hospitals. Future studies of the GOEs should consider including interviews with other user groups as well in order to get information regarding complex aspects that cannot be tackled by closed questions such as the role of the GOE, the users' experiences while in the GOEs and also ways to improve the GOE.

The design recommendations may appear to be a general overview. Nonetheless applicable design recommendations are needed due to the rapid development of urban areas within which GOEs at hospitals can function as green oases. The historical background has shown that the GOEs at healthcare facilities have undergone many changes throughout history. Findings from many disciplines indicate that being in or having a view of nature significantly reduces stress, calms patients and improves clinical outcomes. This study highlights that GOEs have potential as restorative settings. However, many users spent a short period in the GOEs. The weaknesses and positive points regarding the design of each of the GOEs can hopefully give information to health policy-makers, hospital administrators, designers, and others involved in the design and management of healthcare facilities. Careful consideration of the design of GOEs is crucial in order to increase their usage and to capture the benefits derived from spending time in natural settings.

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REFERENCES

Altimier, L. B. (2004). Healing Environments: For Patients and Providers. *Newborn and Infant Nursing Reviews*, 4(2), 89-92.

American Horticultural Therapy Association. Accessed 2nd January 2010 at http://www.ahta.org/

Ananth, S. (2008). Healthy environment, healthy patient. *Hospitals & Health Networks*. March 25, 2008

Appleton, J. (1975). *The Experience of Landscape*. Wiley: New York.

Asano, F. (2008). Healing at a hospital: Integration of physical and non-physical aspects. *Acta Horticulturae, 775*, 13-22.

Barnhart, S.K., Perkins N.H., & Fitzsimonds, J. (1998). Behaviour and outdoor setting preferences at a psychiatric hospital. *Landscape and Urban Planning,* 42, 147-156.

Bengtsson, A., & Carlsson, G. (2006). Outdoor environments at three nursing homes: Focus group interviews with staff. *Journal of Housing for the Elderly, 19*(3/4), 49-69.

Biley, F. (1996). Hospitals: healing environments? *Complementary Therapies in Nursing & Midwifery*, 2, 110 - 115.

Bodin, M., Hartig, T. (2003). Does the outdoor environment matter for psychological restoration gained through running? *Psychology of Sport and Exercise*, 4, 141-153

Brown, J.R.D., & Corry, R. C. (2011). Evidence-based landscape architecture: The maturing of a profession. *Landscape and Urban Planning,* 100, 327-329.

Bryman, A. (2008). Social Research Methods. New York: Oxford University Press, 611

Cooper Marcus, C., & Barnes, M. (2010). Therapeutic Garden Audit for Acute care Hospitals. Forwarded through personal email on October 8, 2010 by Cooper Marcus, C.

Cooper Marcus, C., & Barnes, M. (1999). Acute care general hospitals: Case studies and design guidelines. In Cooper Marcus, C., Barnes, M. (Eds.), *Healing gardens - Therapeutic benefits and design recommendations.* New York: John Wiley & Sons, Inc., 157-234.

Cooper Marcus, C., & Barnes, M. (1995). *Gardens in healthcare facilities: Uses, therapeutic benefits, and design recommendations.* Martinez, CA: The Centre for Health Design.

Dannenmaier, M. (1995). Healing Gardens. *Landscape Architecture Magazine*, Vol. 85, No. 1, 56-80

Davis, B.E. (2011). Rooftop hospital garden for physical therapy. A post occupancy evaluation. *Health Environments Research & Design Journal, 4*(3), 14-43.

Davis, B. E. (2002). *Healing the Whole Person: A Post Occupancy Evaluation of The Rooftop Therapy Park at Fort Sanders Regional Medical Center, Knoxville, Tennessee* (Unpublished master's thesis). East Tennessee State University:Tennessee.

Davis, P. (2007). *Natural Heritage: A Pathway to Health- A descriptive systematic review.* CCW Policy Research Report No. 07/20. Institute of Rural Health, Wales.

Diette, G. B., Lechtzin, N., Haponik, E., Devrotes, A., & Rubin, H. R. (2003). Distraction therapy with nature sights and sounds reduces pain during flexible bronchoscopy: A complementary approach to routine analgesia. *Chest,* 123(3), 941.

Dijkstra, K., Pieterse, M., & Pruyn, A. (2006). Physical environmental stimuli that turn healthcare facilities into healing environments through psychologically mediated effects: systematic review. *Journal of Advanced Nursing*, July, 166-181.

Evidence-Based Medicine Working Group (1992). Evidence-based medicine: A new approach to teaching the practice of medicine. *Journal of the American Medical Association*, 268 (17), 2420-2425.

Frandsen, A.K., Ryhl, C., Folmer, M.B., Fich, L.B.,Øien, T.B., Sørensen, N.L., & Mullins, M. (2009). *Helende Arkitektur*. Institut for Arkitektur og Design Skriftserie, 29

Gerlach-Spriggs, N., Kaufman, R.E., & Warner, S.B. Jr. (1998). *Restorative garden: The healing Landscape*. New Haven: Yale University Press.

Goetz, P., Malone, E., Harmsen, C., Reno, K., Edelstein, E., Hamilton, D. K., Salvatore, A., Mann-Dooks, J., Oland, C., & Nanda, U. (2010). *An introduction to evidence-based design: Exploring health and design*, 2nd Edition. Concord, CA: The Center for Health Design.

Goldin, G. (1994). *Work of Mercy- A Picture History of Hospitals.* The Boston Mills Press: Ontario

Haller, R. (2004). Creating a sensory garden. Oral presentation. Conference proceeding. AHTA conference "Securing Our Health and Wellness" in Atlanta, Georgia.

Hamilton, D. K. (2003). The Four Levels of Evidence-Based Practice. *Healthcare Design*, November.
Hartig, T., Korpela, K., Evans, G.W., and Gärling, T. (1997). A measure of restorative quality in environments. *Scandinavian Housing & Planning Research*, 14,175-194.
Hartig, T., Mang, M., & Evans, G. (1991). Restorative Effects of Natural Environment Experiences, *Environment and Behaviour*, 23, 3-26.
Hendrich, A., Chow, M.P., Bafna S., Choudhary, R., Heo, Y., Skierczynski B.A. (2008). Unit related factors that affect nursing time with patients: spatial analysis of the time and motion study. *Journal of Environmental Health Research*, 2 (2), 40-60
Heslet, L., & Dirckinck-Holmfeld, K. (2007). *Sansernes Hospital*. Arkitektens Forlag.
Hosking, S., & Haggard, L. (1999). Healing the hospital environment- Design, management and maintenance of healthcare premises. New York: Taylor and Francis.
Hosking, S., & Haggard, L. (1999). *Healing the hospital environment- Design, management and maintenance of healthcare premises*. New York: Taylor and Francis.
Johnson, K. (2002). Designing natural therapeutic environments. In Shoemaker, C.A. (Eds.), *Interaction by design: Bringing people and plants together for health and well-being.* Iowa State Press, 149-153.
Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, 15(3), 169-182.
Kaplan, R. & Kaplan, S. (1989). *The Experience of Nature: A Psychological Perspectives*. Cambridge University Press: New York.
Kaplan, S. (1983). A model of person environment compatibility. *Environment and Behavior*, 15, 311-332.
Korpela, K., Hartig, T. (1996). Restorative qualities of favourite places. *Journal of Environmental Psychology*, 16(3), 221-233.
Kearney, A. R., & Winterbottom, D. (2005). Nearby nature and long-term care facility residents: Benefits and design recommendations. *Journal of Housing for the Elderly*, 19(3/4), 7.
Kovary, M. (1999). Healing Landscapes: Design Guidelines for Mental Health Facilities. In Shoemaker, C.A. (Eds.), *Interaction by design: Bringing people and plants together for health and well-being.* Iowa State Press.
Kvale, S., & Brinkmann, S. (2009). *Interviews-Learning the Craft of Qualitative Research Interviewing,* 2nd. Edition. California: Sage Publications, Inc.
Lottrup, L., Stigsdotter, U. K., Meilby, H., & Corazon, S. S. (2012). Associations between use, activities and characteristics of the outdoor environment at workplaces. *Urban Forestry and Urban Greening,* 11 (2).
Malkin, J. (1992). *Hospital interior architecture: Creating healing environments for special patient populations.* New York: Van Nostrand Reinhold.
McBride, D.L. (1999). Nursing Home Gardens. In Cooper Marcus, C., & Barnes, M. (Eds.), *Healing gardens - Therapeutic benefits and design recommendations.* New York: John Wiley & Sons, Inc., 385-430.
Moore, R. C. (1999). Healing Garden for Children. In Cooper Marcus, C., & Barnes M. (Eds). *Healing Gardens- Therapeutic Benefits and Design Recommendations.* New York: John Wiley & Sons, Inc., 323-382.
Mroczek, J., Mikitarian, G., Vieira, E.K., & Rotarius, T. (2005). Hospital design and staff perceptions: An exploratory analysis. *The Health Care Manager*, 24 (3), 233-244.
Nilsson, K., Sangster, M., Gallis, C., Hartig, T., de Vires, S., Seeland, K. & Schipperijn, J. (Eds.) 2011. *Forests, Trees and Human Health.* Dordrecht: Springer.
Parsons, R., & Hartig, T. (2000). Environmental psychophysiology. In Cacioppo, J.T., Tassinary, L.G, & Berntson, G.G. (Eds.), *Handbook of Psychophysiology*. Cambridge University Press, 815-846.
Pati, D., Harvey, T.E., & Barach, P. (2008). Relationships between exterior views and nurse stress: an exploration examination. *Health Environments Research and Design Journal,* 1 (2), 27-38.
Patton, M.Q. (2002). *Qualitative Research & Evaluation Methods*. Sage Publication, Inc: CA

Rodiek, S. & Lee, C. (2009). External Space- Increasing outdoor usage in residential facilities for older adults. *Design and Health Scientific Review*, October. Accessed 15 March 2011 at: www.worldhealthdesign.com

Rodiek, S., 2005. Resident perceptions of physical environment features that influence outdoor usage at assisted living facilities. *Journal of Housing for the Elderly*, 19(3/4), 95.

Said, I. (2006). *Gardens as restorative environments for children in Malaysian hospital setting.* (Unpublished PhD theses). Universiti Teknologi Malaysia: Skudai

Said, I., Salleh, S.Z., Jonid, D.H., Hamid, R., Mohamad, I., & Majid, R. (2002). *Study on the effectiveness of therapeutic garden as a platform to recuperate ill children in the nucleus hospital environment.* Research Management Centre, Universiti Teknologi Malaysia, Skudai, Malaysia.

Sachs, Naomi (1999). Psychiatric Hospitals. In Cooper Marcus, C., & Barnes M. (Eds). Healing Gardens- Therapeutic Benefits and Design Recommendations. New York: John Wiley & Sons, Inc., 235-322

Shackell, A., & Walter, R. (2012). *Greenspace design for health and well-being.* Forestry Commission Practice Guide. Edinburgh.

Shepley, M.M. (1998). Designing for persons with HIV/AIDS. *Journal of Architectural and Planning Research*, 16(1), 17-32

Sherman, S., Varni, J.W., Ulrich, R.S., & Malcarne, V.L. (2005). Post-occupancy evaluation of healing gardens in a paediatric cancer centre. *Landscape and Urban Planning,* 73(2/3), 167-183.

Smith, J. (2007). *Health and nature: The influence of nature on design of the environment of care*. The Centre for Health Design. A Position Paper for the Environmental Standards Council of the Center for Health Design, October 2007

Statistics Denmark (2012). Accessed 5th January 2011 at http://www.dst.dk/HomeUK/Statistics/ofs/Publications/Yearbook.aspx

Statistics Denmark (2009). Accessed 5th January 2011 at http://www.dst.dk/HomeUK/Statistics/ofs/Publications/Yearbook.aspx

Stichler, J.F. (2009). Healthy, healthful, and healing environments: A nursing imperatives. *Critical care Nursing Quarterly*, 32 (3), p 176-188.

Stigsdotter, U.K, Grahn, P. (2003). Experiencing a garden: a healing garden for people suffering from burnout diseases. *Journal of Therapeutic Horticulture*, 14, 38-49.

Stigsdotter, U.K, Grahn, P. (2002). What makes a garden a healing garden? *Journal of Therapeutic Horticulture,* 13, 60-69.

Stoneham, J., & Thoday, P. (1996). *Landscape Design for Elderly and Disabled People.* Garden Art Press: Woodbridge, Suffolk.

Summary of Hospital for the Capital Region-Hospital Plan 2007. Accessed on 15 January 2010 at www.HospitalsplanEngelsk2007.pdf

Thompson, C. W. (2011). Linking landscape and health: The recurring theme. *Landscape and Urban Planning,* 99, 187-195.

Thompson, J.D., & Goldin, G. (1975). *The Hospital: A Social and Architectural History*. Yale University Press: London.

Tse, M. M. Y., Ng, J. K. F., Chung, J. W. Y., & Wong, T. K. S. (2002). The effect of visual stimuli on pain threshold and tolerance. *Journal of Clinical Nursing,* 11(4), 462.

Tyson, M. M. (1998). *The Healing Landscape: Therapeutic Outdoor Environments.* McGraw Hill: New York.

Ulrich, R.S., Zimring, C., Zhu, X. (2008). A review research literature on evidence-based healthcare design. *Journal of Environmental Health Research*, 1 (3), 61-125.

Ulrich, R. S., Simons, R. F., & Miles, M. A. (2003). Effects of environmental simulations and television on blood donor stress. *Journal of Architectural & Planning Research,* 20(1), 38.

Ulrich R.S., Zimring C., Quan X., Joseph A., & Choudhary R. (2004). *The role of the physical environment in the hospital of the 21st century: A once-in-a-lifetime opportunity*. Concord, The Center for Health Design:CA, 21-23.

Ulrich, R. S. (2002). Communicating with the healthcare community. In Shoemaker, C. A. (Eds.), *Interaction by design: Bringing people and plants together for health and well-being.* Iowa State Press, 19-32.

Ulrich, R.S. (1999). Effects of gardens on health outcomes: Theory and research. In Cooper Marcus, C., & Barnes, M. (Eds.), *Healing gardens - Therapeutic benefits and design recommendations.* New York: John Wiley & Sons, Inc., 27-86

Ulrich, R. S. (1993). Biophilia, biophobia, and natural landscapes. In Kellert, S.R. and Wilson, E.O. (Eds.). *The Biophilia Hyphothesis*. Washington D.C: Island Press, 73-137.

Ulrich, R. S. & Parsons, R. (1992). Influences of passive experiences with plants on individual well-being and health. In D. Relf (Ed.). *The role of horticulture in human well-being and social development*. Timber Press: Portland, OR, 93-105.

Ulrich, R. S. (1991). Effects of health facility interior design on wellness: Theory and recent scientific research. *Journal of Healthcare Design,* 3, 97-109

Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science,* 224(4647), 420-421.

Ulrich, R. S. (1981). Natural versus urban scenes: Some psychophysiological effects*. Environment and Behavior,* 13, 523-556.

Van den Berg, A.E., Koole, S.L., & Van der Wulp, N.Y. (2003). Environmental preference and restoration: (How) are they related? Journal of Environmental Psychology, 23, 135–146

Venolia, C. (1994). *Creating a healing environment.* The Centre for Health Design. Martinez: California.

Viets, E. (2009). *Lessons from Evidence-Based Medicine: What healthcare designers can learn from the medical field*. Accessed 1st October 2012 at http://www.herdjournal.com/article

Vischer, J.C. (2008). The effects of the physical environment on job performance: Towards a theoretical model of workplace stress. *Stress and Health*, 23 (3), 175-184.

Whitehouse, S., Varni, J.W., Seid, M., Cooper Marcus, C., Ensberg, M.J., Jacobs, J.R., & Mehlenbeck, R.S. (2001). Evaluating children's hospital garden environment: Utilization and consumer satisfaction. *Journal of Environmental Psychology*, 21, 301- 314.

Wilson, E.O. (1984). Biophilia. Cambridge: Harvard University Press.

LIST OF PAPERS

The thesis is based on the research contained in the following four papers, which are referred to by the corresponding Roman numerals in the main body of the introduction.

I: Faris, S.A.S., Stigsdotter, U.K., Nilsson, K. (2012). A review of design recommendations for outdoor areas at health care facilities. Journal of Therapeutic Horticulture, Vol. 22 (2), 33-47.

II: Faris, S.A.S., Stigsdotter, U.K., Lottrup, L.P., Nilsson, K. (2012). Employees' use, preferences, and restorative benefits of green outdoor environments at hospitals. International Journal on Sustainable Tropical Design Research and Practice, Vol. 5 (2), 77-92.

III: Faris, S.A.S., Stigsdotter, U.K., Nilsson, K. Patients' use, preferences and restorative benefits of green outdoor environments at hospitals. Urban Forestry and Urban Greening- In review.

IV: Faris, S.A.S., Stigsdotter, U.K., Nilsson, K. Restorative green outdoor environments at acute care hospitals: An application of the Common Design Recommendations and the Perceived Restorativeness Scale. Journal of Social Sciences and Humanities- In review.

The four papers are not included in this version of the thesis due to copyright.

APPENDIX A

Questionnaire (English)

FOREST & LANDSCAPE

Date_____Time_____

Place_____

Questionnaire on the study of hospital landscape in the Capital Region, Copenhagen

The purpose of this survey is to collect data for my PhD research project at Forest and Landscape, University of Copenhagen on the design of landscape in selected acute care hospital in the Capital Region, Denmark. This study is in collaboration with Universiti Putra Malaysia, Malaysia. In this study we are interested in your experience of hospital landscape and how it affects you. It is important that you answer based on how you personally perceived this place.

The questionnaire will take approximately 10-15 minutes to answer. Your contribution to this study is hoped to improve the design of hospital landscape in the region. I seek your full cooperation to complete this questionnaire.

When you select your answer, please tick: As this ☒ *and not* ☒

If you have made a mistake, darken the entire box: ■

1. The reason you are here?

☐ I work here as a _____

☐ I am visiting somebody here

☐ I am a (short term / long term) patient here *(Please underline the type of patient you are)*

2. How do you use the garden/ hospital outdoor environment in this hospital and on average, how much time you have or plan to spend in it? *(You can tick more than one activity).*

	5-10 mins.	11-20mins	21-30mins.	31mins-1hrs	≥1hr
☐ Having my lunch	☐	☐	☐	☐	☐
☐ Sit and talk	☐	☐	☐	☐	☐
☐ Sit and relax	☐	☐	☐	☐	☐
☐ Quick chat	☐	☐	☐	☐	☐
☐ Walking around	☐	☐	☐	☐	☐

	5-10 mins.	11-20mins	21-30mins.	31mins-1hrs	≥1hr
☐ Using the cell phone	☐	☐	☐	☐	☐
☐ Work meeting	☐	☐	☐	☐	☐
☐ Sit and wait	☐	☐	☐	☐	☐
☐ Sit quietly/contemplating	☐	☐	☐	☐	☐
☐ Read a book/magazine	☐	☐	☐	☐	☐
☐ Relax and rest	☐	☐	☐	☐	☐
☐ Get away from stressful environment	☐	☐	☐	☐	☐
☐ Enjoy the garden	☐	☐	☐	☐	☐
☐ Walk through it	☐	☐	☐	☐	☐
☐ To forget my worries	☐	☐	☐	☐	☐
☐ Exercise	☐	☐	☐	☐	☐
☐ Smoking	☐	☐	☐	☐	☐

☐ Other_____

☐ Other_____

☐ Other_____

The following questions use an 11 point scale where you are asked to consider how well the given statements suit your experience or perception.

If you think that the statement does not fit your experience or view at all, please mark "0" and if you agree completely, please tick "10".

3. What would you prefer from the hospital garden?
Please mark your answer on the given scale for each statement.
(Please tick one box)

	No		Very little		Quite little		Very much		Much		Completely
	0	1	2	3	4	5	6	7	8	9	10
As a place to unwind and think	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
As a place to forget my sickness or worries	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

2

	No	Very little	Quite little	Very much	Much	Completely
As a place to observe social life	0 1 2 3 4 5 6 7 8 9 10					
As a place to participate in social life	0 1 2 3 4 5 6 7 8 9 10					
As a place where I can be with family or friends	0 1 2 3 4 5 6 7 8 9 10					
As a place for children and adults, sick or healthy	0 1 2 3 4 5 6 7 8 9 10					

4. We would like to know your experience with the hospital garden and to investigate this, we have listed statements which we will ask you to consider. *(Please tick one box)*
If you think that the statement does not fit your experience or view at all, please mark "0" and if you agree completely, please tick "10".

	No	Very little	Quite little	Very much	Much	Completely
This place is like a refuge from things that distract me	0 1 2 3 4 5 6 7 8 9 10					
When I'm here, I feel no requirement to concentrate	0 1 2 3 4 5 6 7 8 9 10					
Spending time here gives me a break from my every day routine	0 1 2 3 4 5 6 7 8 9 10					
In this place I will remove matters which usually require my attention	0 1 2 3 4 5 6 7 8 9 10					
Being here helps me to stop thinking on the things I must do	0 1 2 3 4 5 6 7 8 9 10					
This place raises my curiosity	0 1 2 3 4 5 6 7 8 9 10					

3

	No	Very little	Quite little	Very much	Much	Completely
My attention is caught by many interesting things here	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
This place is fascinating	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
There is much to discover and look at here	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
What's happening in the hospital garden really captures my interest	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Everything here is in its proper place	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
This site is designed in accordance with a clear plan	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
The elements here fit together in a natural way	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
It is easy to see how organized it is here	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
In this place, I feel that it is a small world in itself	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
I feel like this place is large	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
This place is big enough to offer opportunity to discover and explore many things	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Being here is consistent with my personal desires	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					

	No	Very little	Quite little	Very much	Much	Completely
It is easy to do what I want here	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
There is not much here that prevent me from doing what I would like to do	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
This place require me to be in a way that I choose to be on my own choice	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
What I can do here is what I like to do best	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
I can easily navigate here	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
I like this place	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					

Next, we would like to know your opinion on the outdoor environment of the hospital

5. How much do you enjoy the features in the hospital garden? *(You can tick more than one activity).*
If you think that the features you like the most, please mark "10" and if don't enjoy it completely, please tick "0".
Please mark your answer on the given scale for each statement.

	No	Very little	Quite little	Very much	Much	Completely	Not present
Water feature	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						
Vegetation (such as trees, flowering shrubs)	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						

	No	Very little	Quite little	Very much	Much	Completely	Not present
Shelter (such as trellis, gazebos)	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Fresh air, breezes	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Sunshine	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Bird sound	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Other_____	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Other_____	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Other_____	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐

6. Are you satisfied with the hospital outdoor garden? *(Please tick one box)*

☐ Very satisfied

☐ Satisfied

☐ Neither /Nor

☐ Unsatisfied

☐ Very unsatisfied

7. Other features that you think the garden in the hospital should have?

_____

_____

_____

_____

_____

Finally, a few questions about yourself.

8. Are you a ☐ Man or ☐ Woman

9. In what year were you born? _____ *(please write clear figure)*

10. In which country were you born in? *(Please tick one box)*

- ☐ Denmark
- ☐ Other_____

11. What is your last completed training? *(Please tick one box)*

- ☐ Primary 7 – 10 years (eg. public or private school)
- ☐ Secondary education (eg. gymnasium, HF, HTX, HHX)
- ☐ Vocational training (eg. craft, office or bank training)
- ☐ Higher education-short term
- ☐ Medium Higher Education (eg. pedagogy, teacher, nurse)
- ☐ Bachelor's degree, professional (eg. Bsc)
- ☐ Higher education-more than 5 years (eg. candidate, engineering, doctorate)
- ☐ Others, please write:_____

12. Marital status *(please tick one box)*

- ☐ Are you in a solid relationship/ married?
- ☐ Are you single?

13. Do you have access to the following areas where you live? *(You can tick more than one answer)*

- ☐ Own garden
- ☐ Balcony or terrace
- ☐ Common courtyard
- ☐ Neither

14. How often do you stay in the outdoor environment in summer? *(Please tick one box)*

- ☐ Daily
- ☐ Several times a week
- ☐ Weekends
- ☐ Monthly
- ☐ Rarely/ Never

Thank you very much for your help in completing this questionnaire.

APPENDIX B

Questionnaire (Danish)

SKOV & LANDSKAB

Dato_____Tid_____

Stednavn_____

Spørgeskema til undersøgelse af hospitalslandskaber i Region Hovedstaden, København

Dette spørgeskema er et led i et ph.d.-forskningsprojekt ved Skov og Landskab, Københavns Universitet som omhandler udformning af landskabet omkring udvalgte hospitaler i Region Hovedstaden, (Danmark). Undersøgelsen er del af et samarbejde mellem Københavns Universitet og Universiti Putra Malaysia, Malaysia. I undersøgelsen er vi interesserede i din oplevelse af landskabet omkring netop dette hospital, samt i hvordan det påvirker dig. Det er vigtigt, at du giver dine svar ud fra hvordan du personligt opfatter stedet.

Spørgeskemaet vil tage ca. 10-15 minutter at besvare. Med dit bidrag til undersøgelsen håber vi i fremtiden at kunne være med til at forbedre udformningen af hospitalslandskaber i Hovedstadsregionen.

Når du markerer dit svar skal du så vidt muligt sætte kryds: Sådan ☒ ☒ *og ikke*

Hvis du fortryder et kryds, så dæk hele kassen med farve: ■

1. Hvad er grunden til at du er her?

☐ Jeg arbejder her. Min beskæftigelse er: _____

☐ Jeg er her for at besøge nogen

☐ Jeg patient på hospitalet (i kort tid/længere tid)
(understreg venligst hvilken type patient du er)

2. Hvordan bruger du haven / hospitalets udendørs miljø? Og hvor lang tid bruger du i gennemsnit på den enkelte aktivitet? *(Du kan afkrydse mere end én aktivitet).*

	5-10 mnt.	11-20mnt	21-30mnt.	31mnt.-1time	≥1time
☐ Jeg spiser frokost her	☐	☐	☐	☐	☐
☐ Jeg sidder og snakker	☐	☐	☐	☐	☐
☐ Jeg sidder og slapper af	☐	☐	☐	☐	☐
☐ Jeg tager en hurtig snak med andre	☐	☐	☐	☐	☐
☐ Jeg går en tur rundt i haven	☐	☐	☐	☐	☐

	5-10 mnt.	11-20mnt	21-30mnt.	31mnt.-1time	≥1time
☐ Jeg snakker i mobil	☐	☐	☐	☐	☐
☐ Jeg arbejder / holder møde?	☐	☐	☐	☐	☐
☐ Jeg sidder og venter	☐	☐	☐	☐	☐
☐ Tænker / mediterer	☐	☐	☐	☐	☐
☐ Jeg læser en bog/magasin	☐	☐	☐	☐	☐
☐ Jeg slapper af og hviler	☐	☐	☐	☐	☐
☐ Jeg er her for at komme væk fra et stresset miljø	☐	☐	☐	☐	☐
☐ Jeg nyder haven	☐	☐	☐	☐	☐
☐ Jeg går tur gennem haven	☐	☐	☐	☐	☐
☐ At være her hjælper til at jeg glemmer mine bekymringer	☐	☐	☐	☐	☐
☐ For motionens skyld	☐	☐	☐	☐	☐
☐ Ryger	☐	☐	☐	☐	☐
☐ Andre_____					
☐ Andre_____					
☐ Andre_____					

I følgende spørgsmål anvendes en 11-punkts-skala, hvor du bliver bedt om at overveje, hvor godt de givne udsagn passer til din erfaring eller opfattelse af stedet her.

Hvis du synes udsagnet ikke passer til din oplevelse skal du afkrydse tallet "0" og hvis du er fuldstændig enig, bedes du sætte kryds ved "10".

3. Hvilken oplevelse vil du foretrække i hospitalets have?
Sæt venligst et kryds på skalaen ud for hvert udsagn

	Slet ikke		Meget lidt		Ganske lidt		Nogenlunde			Meget	Fuld-stændig
	0	1	2	3	4	5	6	7	8	9	10
Som et sted at slappe af og tænke	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Som en sted at glemme alt om min sygdom eller bekymringer	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

2

	Slet ikke	Meget lidt	Ganske lidt	Nogenlunde	Meget	Fuld-stændig
	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Som et sted at observere socialt liv	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					
Som et sted til at deltage i det sociale liv	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					
Som et sted hvor jeg kan være sammen med familie eller venner	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					
Som et sted for børn og voksne, syge eller raske	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					

4. Vi vil gerne vide noget om din oplevelse af hospitalshaven og for at kunne finde ud af det, har vi opsummeret nogle udtalelser, som vi vil bede dig om at overveje. *(Sæt kryds i ét felt) Hvis du tror, at udtalelsen ikke passer med din erfaring eller synspunkter i øvrigt, husk at mærke "0" og hvis du er fuldstændig enig, bedes du sætte kryds ved "10".*

	Slet ikke	Meget lidt	Ganske lidt	Nogenlunde	Meget	Fuld-stændig
	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Dette sted er et tilflugtssted fra forstyrrende elementer	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					
Når jeg er her, oplever jeg ingen krav om at være koncentreret	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					
At være her giver mig en pause fra mine daglige rutiner	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					
Dette er et sted, hvor jeg kommer væk fra det, der sædvanligvis kræver min opmærksomhed	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					
At være her hjælper mig til ikke at tænke på mine daglige pligter	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					
Dette sted vækker min nysgerrighed	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐					

	Slet ikke	Meget lidt	Ganske lidt	Nogenlunde	Meget	Fuld-stændig
Min opmærksomhed fanges af mange interessante ting her	0	1 2 3	4 5	6 7 8	9	10
Dette sted er fascinerende	0	1 2 3	4 5	6 7 8	9	10
Der er meget at opdage og undersøge her	0	1 2 3	4 5	6 7 8	9	10
At følge det der sker i hospitalshaven fanger virkelig min interesse	0	1 2 3	4 5	6 7 8	9	10
Alting på dette sted er på sin rette plads	0	1 2 3	4 5	6 7 8	9	10
Stedet er tydeligvis udformet efter en nøje plan	0	1 2 3	4 5	6 7 8	9	10
Alting her passer sammen på en naturlig måde	0	1 2 3	4 5	6 7 8	9	10
Det er let at se hvordan det er organiseret her	0	1 2 3	4 5	6 7 8	9	10
Jeg oplever stedet som en lille verden i sig selv	0	1 2 3	4 5	6 7 8	9	10
Det føles som om dette sted er stort	0	1 2 3	4 5	6 7 8	9	10
Stedet er tilstrækkeligt stort til at give mulighed for at opdage og udforske mange ting	0	1 2 3	4 5	6 7 8	9	10
At være her stemmer godt overens med mine personlige ønsker	0	1 2 3	4 5	6 7 8	9	10

	Slet ikke	Meget lidt	Ganske lidt	Nogenlunde	Meget	Fuld-stændig
Det er let at gøre hvad jeg vil her	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Der er ikke noget der hindrer mig i at gøre hvad jeg har mest lyst til	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Her kan jeg være mig selv	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Her kan jeg gøre hvad jeg har lyst til	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Jeg kan uden problemer finde rundt her	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					
Jeg synes om at være her	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10					

Vi vil gerne høre din mening om udemiljøet omkring dette hospital.

5. I hvor høj grad synes du om følgende indslag? *(Sæt gerne flere kryds).*
De elementer du synes bedst om, bedes du markere "10", og hvis du ikke bryder dig om dem, skal du sætte kryds ved "0".
Mærk din svar på den givne skala for hvert udsagn.

	Slet ikke	Meget lidt	Ganske lidt	Nogenlunde	Meget	Fuld-stændig	Ikke tilstede
Vandindslag	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						
Vegetation (blomstrende buske, træer)	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						
Plæne	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						

5

	Slet ikke	Meget lidt	Ganske lidt	Nogenlunde	Meget	Fuld-stændig	Ikke tilstede
Læ (såsom espalier, pavilloner)	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Frisk luft, vindpust	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Solskin	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Fuglesang	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
Andet_____	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
_____							
Andet_____	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
_____							
Andet_____	0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10						☐
_____							

6. Er du tilfreds med udemiljøet omkring hospitalet? *(sæt et kryds)*

☐ Meget tilfreds

☐ Tilfreds

☐ Hverken/ eller

☐ Utilfreds

☐ Meget utilfreds

7. Andre indslag du synes udemiljøet ved et hospital kunne indeholde?

_____
_____
_____
_____
_____
_____

Til sidst nogle få spørgsmål om dig selv:

8. Er du ☐ Mand eller ☐ Kvinde

6

9. I hvilket år er du født? _____ *(Skriv venligst tydeligt)*

10. I hvilket land er du født? *(sæt et kryds)*

- ☐ Danmark
- ☐ Andet_____

11. Hvad er din sidst afsluttede uddannelse? *(Sæt kryds i én rubrik)*

- ☐ Grundskole 7 – 10 år (feks. folke-, real eller privatskole)
- ☐ Mellemlang videregående uddannelse 3-4 år (feks. pædagog, lærer, sygeplejerske)
- ☐ Gymnasial uddannelse (feks. gymnasium, HF, HTX, HHX)
- ☐ Bacheloruddannelse, professionsbachelor (feks. diplomingeniør)
- ☐ Erhvervsfaglig uddannelse (feks. håndværks-, kontor- eller bankuddannelse)
- ☐ Lang videregående uddannelse, mere end 5 år (feks. kandidat, civilingeniør, læge)
- ☐ Kort videregående uddannelse 1-2 år (feks. laborant, tekniker, datamatiker)
- ☐ Andet:_____

12. Civilstand *(sæt et kryds)*

- ☐ Lever du i fast parforhold/ gift?
- ☐ Er du enlig?

13. Har du adgang til nogle af følgende der hvor du bor? *(Du kan afkrydse mere end ét svar).*

- ☐ Egen have
- ☐ Balkon eller terrasse
- ☐ Fælles gårdhave
- ☐ Ingen af delene

14. Hvor ofte opholder du dig udenfor om sommeren? *(Sæt et kryds)*

- ☐ Dagligt
- ☐ Flere gange om ugen
- ☐ Weekender
- ☐ En gang om måneden
- ☐ Sjældent/aldrig

Mange tak for din hjælp

APPENDIX C

Common Design Recommendation (CDR) form

The Common Design Recommendations (CDR) for Acute Care Hospital

Name of Auditor _____
Date _____

Name & location of the facility: _____

- If an item is present, mark with "√". If the item is not present, mark with "-"

The CDR	The components	√ / -
Location and view	Locate the garden near common facilities	
	Create welcoming garden entrances	
	Provide views of the garden from inside the building	
Accessibility	Ensure easy access	
	Ensure paths are accessible for all	
	Provide a way finding system for easy navigation	
Layout and space	Create hierarchy and variety for different spaces and paths	
	Create transitional space between indoors and outdoors	
Seating arrangement	Offer different sorts of seating	
	Offer both fixed and moveable seats	
	Provide both open and covered seating	
Planting	Use plants that offer multi-sensory experience	
	Use native plants	
	Use plants which attract birds and insects	
	Avoid toxic and allergy-triggering plants	
Design details	Use colors in hardscape material to create contrast	
	Include play elements	
	Include water features	
	Include sculptures	
Practical services	Include drinking fountains	
	Provide restrooms	
	Provide storage for maintenance tools	

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